March 1999

Jane's

NAVY INTERNATIONAL

Vol. 104 No. 2

- The two sides of Thursday War
- ASW sonar developments
- Navies in peace support operations

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The realities of post-Cold War geopolitics necessitate new roles and missions for today's navies – creating complex challenges and important questions for future naval intervention.

Front cover: A special-mission Falcon 20 jet operated by FR Aviation overflies a Royal Navy Type 23 frigate during a recent 'Thursday War' exercise. This issue of *JNI* includes an in-depth feature on the two sides of 'Thursday War'. *(photo: Richard Scott)*

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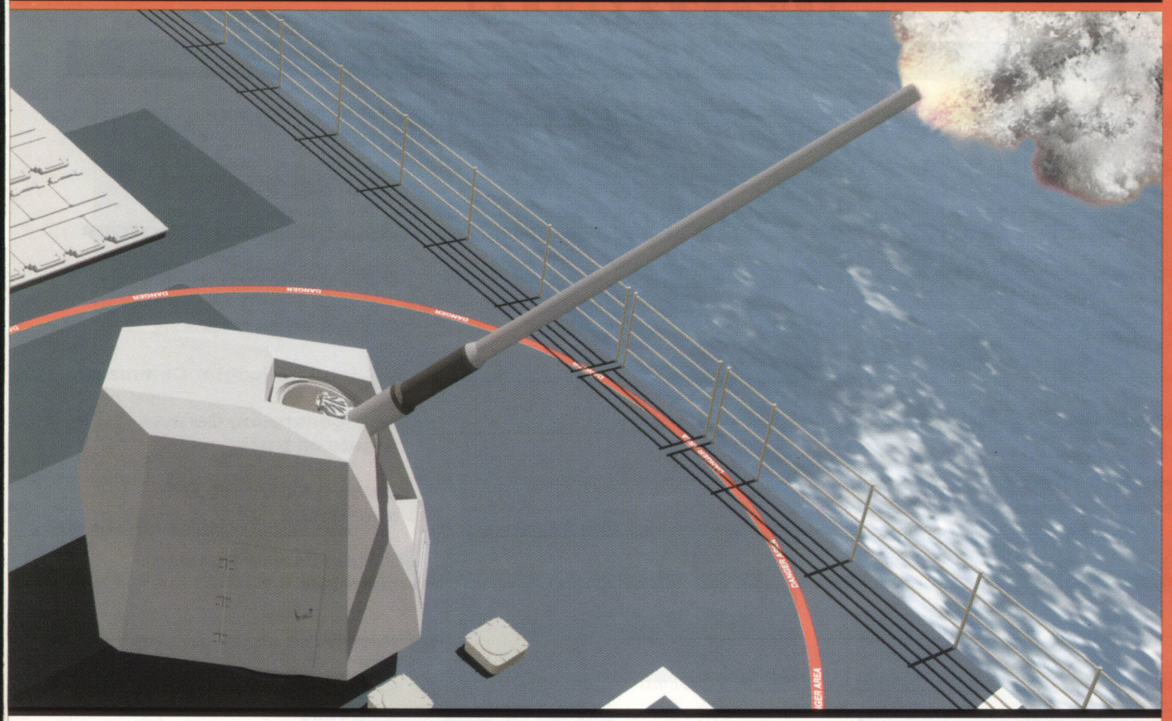
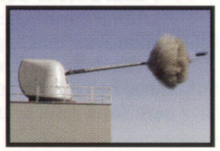


The Mk 45 puts a premium on performance - it's the lightest, most accurate and reliable 5-inch (127-mm) naval gun ever built. Ships equipped with the Mk 45 have an effective weapon for anti-surface, strike, fire support, and anti-air warfare missions. And in the new Mod 4 configuration, Mk 45 will deliver over-the-horizon range and provide a new gun shield to reduce overall radar signature, system maintenance and production cost.

Today, the 54-Caliber Mk 45 is the 'naval gun of choice' for the U.S. Navy and the fleets of Australia, Greece, New Zealand, Spain, Thailand and Turkey. It has been selected for over 200 installations on board frigates, destroyers, cruisers and amphibious assault ships, and can be used for both conventional and modularized ship applications.



Recently, the new 62-Caliber Mk 45 Mod 4 has successfully completed prototype firing tests that verified system readiness to fire the new extended-range guided munition (ERGM). System modifications allow the Mod 4 to handle and fire ERGM, which together will provide increased lethality and extend range to over 60 miles for naval surface fire support. The Mk 45 Mod 4 will join the Fleet on board new Arleigh Burke-class DDGs in 2001. And Mod 4 improvements can be backfit to all existing Mk 45 naval guns.

The Mk 45 Mod 4 - the naval gun system proven for extended-range performance.

United Defense

NATO begins massive reduction of headquarters

BY SHARON HOBSON

Next month NATO will begin the transition to a new command structure aimed at reducing the number of headquarters; increasing operational flexibility; enhancing the European security and defence identity; and reinforcing the trans-Atlantic link.

The new structure reduces the number of NATO headquarters from 65 to 20. It reflects the standing down of CINCHAN (Commander-in-Chief Channel) in 1994, and retains the alliance's two strategic commands: Allied Command Atlantic (ACLANT) and Allied Command Europe (ACE). The next level is the Regional Command, with two in Europe (RC North in Brunssum, Netherlands, and RC South in Naples, Italy), and three in the Atlantic (RC West in Norfolk, Virginia, USA; RC East in Northwood, Southern England; and RC Southeast in Lisbon, Portugal).

In addition to the Regional Commands, ACLANT will have two combatant commands – Striking Fleet Atlantic (STRIKEFLTLANT) and Submarine Command Atlantic (SUBACLANT). The third and fourth levels of command – the Principle Subordinate Command and the sub-Principal Subordinate Command, respectively – which existed under the old structure will disappear, but a NATO staff officer told *JNI* that "assets can still be requested ... commanders just won't have to go through another level of staff to do so."

In ACE, each Regional Command will be supported by two Component Commands with region-wide responsibilities for air and naval operations. There are also seven Joint Sub-Regional Commands, which owe their existence as much to political sensitivities as to their ability to provide land component advice. Inherent in the new structure is NATO's ability to field three Combined Joint Task Forces (CJTFs) – two land-based and one sea-based. Captain (N) Drew Robertson, Director NATO Policy at the Canadian Department of National Defence, explained: "Two [CJTFs] in Europe will be based on Regional Commands North and South."

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Canadian *Halifax*-class frigate, *Toronto*, leads a line of NATO ships. *(photo: HM Steele/Jane's)*

Approximately 115 of the 700 personnel in each of those headquarters will be used to provide the "core of a deployable task force headquarters ... within 30 days from the time the alliance decides it wants to go somewhere, we can have a deployed headquarters ready to deal with corps-size activity, about 100,000 troops."

A former Deputy Chief of Staff at Supreme Allied Command Atlantic (SACLANT), Canadian Rear Admiral (ret) Bruce Johnston, told *JNI* that STRIKEFLTLANT – the sea-based CJTF – will be "seen in European circles as most likely to be used in the Mediterranean. As such it will come under RC South and SACEUR [Supreme Allied Command Europe]. So this key element of SACLANT ... is most likely to be employed by RC South."

SACLANT therefore functions as a force provider to SACEUR, with the key commands in the new organisation being SACEUR, RC South and STRIKEFLTLANT – all US-led commands.

Admiral Johnston thinks the restructuring reflects the increased focus on NATO's southern flank, and does not succeed in reaffirming the transatlantic link. "When SACLANT doesn't have responsibility for the defence of North America, then it shows that there is no interest within NATO at the moment in using NATO's structures to manage crises in and around the Atlantic as opposed to in and around Europe."

■ What do the NATO changes mean to Canada? See Analysis on page 9.

Assistant Editor joins the Jane's Navy International team

0033322

Joshua J Corless has joined *Jane's Navy International* as Assistant Editor. Josh hails from North Carolina, USA, and obtained his Masters degree at Lancaster University, England, for which he wrote his thesis on "The proliferation of Sub-Surface Naval Technology and the Future of Undersea Warfare: Trends and Strategies."
***JNI* Editor Peter Howard commented: "Josh arrives at a challenging time and I'm delighted to have his support."**

Right issue, wrong year

I apologise to readers for the error on the contents page of out first issue of 1999. The Masthead had 1998 alongside. It should have been 1999. Peter Howard

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Denmark chooses EUROTORP

Denmark has contracted the Franco-Italian Eurotorp GEIE, a joint venture between Whitehead Alenia Sistemi Subacquei, DCN International and Thomson-CSF, to provide a number of MU 90 lightweight torpedoes, as well as four Torpedo Launching Systems for the Royal Danish Navy (RDN).

The Danish Naval Materiel Command (NMC) selected the MU 90 after a comprehensive operational and cost evaluation.

The major operational requirements identified by the NMC include satisfactory performance in confined littoral waters and operation within recently imposed safety parameters.

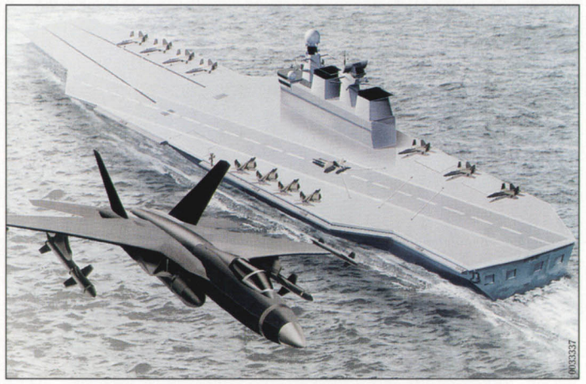
Eurotorp claims that the possibility exists for future agreements to provide for the RDN's present and future torpedo requirements.

The MU 90 uses an advanced acoustic homing head with a digital signal and data processor which is capable of achieving high-detection ranges against anechoic-coated submarines in both deep and very shallow water. Speed can vary anywhere between 29kt and 50kt.

The MU 90 is also incorporates a high electronic counter-countermeasures capability which makes it immune to most types of countermeasures. The weapon features very low self-radiated noise and is armed with a powerful directed energy charge.

UK's new carrier project begins business involvement

BY PETER HOWARD



Artist's impression of a conventional take-off and landing (CTOL) concept of the future carrier (CVF) based on the Boeing JSF. *(illustration: Crown Copyright)*

Real business involvement in the UK's future carrier project (CVF) has begun with an Invitation to Tender (ITT) to six major defence companies to bid for initial work.

The list could be said to be five major companies as a few days before a UK Ministry of Defence (MoD) British Aerospace had agreed with GEC to buy their Marconi Electronic Systems interests. The ITT went to both BAe Defence Systems and Marconi addresses and to Lockheed Martin, Raytheon, Boeing and Thomson-CSF.

The MoD issued on 25 January the ITT for the initial assessment phase of the CVF project. "The new carriers will be acquired through Smart Procurement methods, beginning with the assessment phase", said UK Defence Secretary George Robertson. "The companies will be given the freedom to use all the latest technology on their designs and innovative ideas will be encouraged as a way of cutting costs and improving operational effectiveness."

The assessment phase has two main stages beginning with the examination of a variety of design options – which will also "inform our choice of the Future Carrier Borne Aircraft", said Robertson. Following this detailed work will determine the carriers' design parameters and reduce technological risk. Completion of this work is due for 2003, paving the way for full development and construction. A prime contractor should also be selected in 2003 and the government has said the carriers will be built in the UK.

The last carrier built in the UK was *Ark Royal*, last of the *Invincible* class, built by Swan Hunter in north east England and about half the size of the two CVFs which will replace the three existing carriers. The company does not currently have the capacity but is seeking planning permission to build the largest building drydock in Europe.

Other yards which could build a ship of around 40,000 tonnes are Harland & Wolff in Belfast, Northern Ireland, Kavaerner Govan in Scotland, and Marconi Marine at Barrow or Birkenhead in north-west England.

Each CVF will have a cost ceiling of £740 million (US$1.2 billion) – not including aircraft – and the crew (with air group) should total 1,200. Planners are putting the accent on maximum use of commercial standards (learning lessons from the new helicopter carrier HMS *Ocean*), new shipbuilding techniques, cost effectiveness, reduction in manpower where possible, and an all-electric ship. The in-service date of the first CVF is 2012.

Chilean Navy's biggest disposal list for 20 years

The single greatest disposal of Chilean naval material of the last 20 years is under way, *writes Adrian J. English.*

The largest unit involved is the 27,500-tonne fleet replenishment tanker *Almirante Jorge Montt* (formerly the UK's Royal Fleet Auxilliary *Tidepool*). Though in excellent condition, this vessel proved expensive to operate and was removed from the navy list in December 1997.

The 480-tonne harbour oiler *Guardian Brito*, together with the 1,750-tonne ocean-going tugs *Yelcho* and *Colo-Colo* are also slated for disposal. A sister-ship, the *Leucotonne*, and the 'Sa'ar IV'-class missile attack craft *Papudo* have also been withdrawn from service but do not appear on the sales list which is completed by the auxilliary patrol craft *Marinero Fuentealba*, the medical ship *Cirujano Videla* and the Batral-class landing ship *Maipo*.

The ex-polar transport *Piloto Pardo* was recently sold to commercial operators, and now operates between the Chilean mainland and Easter Island.

The Leander-class frigate *Baquedano* (formerly HMS *Ariadne*), which unlike her sister-ship *Zenteno* (formerly HMS *Achilles*) was not modernised to the same specifications as other Leander-class vessels, also seems a likely candidate for disposal in the foreseeable future. The large guided missile destoyers *Prat* (formerly HMS *Norfolk*) and *Latorre* (formerly HMS *Glamorgan*), both of which have recently been suffering major mechanical problems, are also likely candidates for disposal.

The withdrawl of so many vessels within a relatively short time will leave the Chilean fleet at its weakest for over a century. Although a memorandum of understanding was recently signed between ASMAR and Fincantieri for four to six frigates in the 3,500-tonne displacement range, the first of these vessels is unlikely to be in service within the next five years.

Negotiations for the US$277.5 million purchase of three Type 22 class frigates from the UK Royal Navy were said to be at an advanced stage by the time of the diplomatic crisis created by the detention of General Augusto Pinochet in the UK – which followed an extradition request from Spain for alleged human rights abuses in Chile during Pinochet's rule from 1973 to 1990. The crisis froze all pending military purchases by Chile from the UK and Spain.

UK's new joint command will have 33 navy helos

BY PETER HOWARD

Thirty three helicopters will be provided by the UK Royal Navy to the new Joint Helicopter Command announced by the UK Ministry of Defence (MoD) on 25 January.

The aircraft will come from 845/846 and 848 Squadron Sea King Mk 4s and 847 Squadron Gazelles/Lynx. The new command will also have 230 British Army and 80 Royal Air Force (RAF) battlefield helicopters, and the first commander will be Air Vice Marshal David Niven. He led the Joint Helicoper Command study team and his new headquarters will be at Wilton in south-west England where HQ Land – the lead command with full budgetary authority – is also based.

The command will have 12,000 personnel and the 350 helicopters will include the army's new 16 Air Assault Brigade which is to receive Apache attack helicopters. The command will not include those normally based on warships or used for search and rescue. The Initial Operating Capability date is 1 October this year with full Operational Capability on 1 April next year.

Royal Navy Sea Kings (pictured), Gazelles and Lynx helicopters will join the new Joint Helicopter Command, which becomes fully operational in April 2000. *(photo: Royal Navy)*

AVM Niven stressed the new command would have the accent on teamwork, would build on successful service cooperation – but would be aware of the importance of single service ethos. He said joint training in battlefield support had not always worked well and there would be in the new command close integration day-to-day and the creation of an integral framework.

"You can't just take an RAF pilot one day and send him to sea the next to work with (HMS) Ocean. It takes time – and for support crews also", he said.

Keel laid for new German frigate

BY JOSH CORLESS

The keel of the next-generation German Type 124 Sachsen-class frigate was laid at the Blohm & Voss shipyard in Hamburg on 1 February. The Type 124 anti-air warfare (AAW) ships are needed to replace the German Navy's ageing Lütjens-class guided missile destroyers. The design is a result of a collaborative effort with the Netherlands, and is based on a common AAW system using the Evolved Sea Sparrow (ESSM) surface-to-air missile.

The ARGE F 124 consortium, consisting of Blohm & Voss GmbH, Howaldstswerke Deutsche Werft AG and Thyssen Nordseewerke GmbH, was awarded the DM3 billion (US$5.16 billion) contract for three of the 5,600 frigates with an option for a fourth awarded in June 1996 . However, a fourth ship is unlikely to be built due to German defence budget restraints. Each yard is expected to build one of the frigates with Blohm & Voss building the first. All ships will be equipped with 8 Harpoon surface-to-surface missiles, and the Mk41 VLS with 32 cells for the SM 2 Block IIIA and ESSM. The Type 124 will also feature Signaal's APAR multi-function radar and 3-D SMART-L radar, two NFH 90 helicopters and a reduced Radar Cross Section.

Machinery trials are projected for 2001 and weapons trials in 2002, with final delivery of *Sachsen* to follow in November 2002. *Hamburg* and *Hessen*, the second and third Type 124s, are scheduled for delivery in December 2004 and December 2005.

Two sections of the new Type F 124 being assembled at Blohm + Voss, Hamburg, Germany. Three Sachsen-class vessels are scheduled to be in service by 2005. *(Photo: Michael Nitz)*

Repairs for HMAS *Westralia*

HMAS *Westralia* has had a repair programme approved by the Chief of the Royal Australian Navy (RAN), Vice Admiral Don Chalmers.

The RAN's 40,870-tonne underway replenishment ship suffered an onboard fire that killed four crew members on 5 May 1998.

The official inquiry into the incident, launched in August 1998) concluded that the fire was caused by a faulty fuel line in the engine room (see *JNI* p 6 Jan/Feb 1999).The four sailors who died were killed by the effects of carbon monoxide poisoning. Responsibility for the accident was placed on the RAN and ADI Ltd, the *Westralia's* support contractor.

The repair programme will incorporate many of the 114 seperate recommendations compiled by the inquiry, including upgrades to environmental and exhaust controls, firefighting systems, main engine controls and electrical generating capacity. Escape trunks are also being fitted.

Tenders for the repair and refit were due by 12 February 1999, with work expected to begin by the end of this month. The RAN hopes to have *Westralia* back in service by early 2000.

BAe announces Batch 2 KDX CMS deal with Korea

BY JOSH CORLESS

A £46 million export order has been awarded to to British Aerospace's Defence Systems Group (Land and Sea Systems) by Samsung Electronics Corporation for the development and production of the combat management system (KDCOM 2) for three Batch 2 KDX destroyers for the Republic of Korea Navy (RoKN).

The KDX Batch 1 guided-missile destroyer is the most modern surface combatant in the RoKN and is designed with an emphasis on anti-air warfare (AAW), as well as credible anti-submarine warfare (ASW) and anti-surface warfare capabilities. The KDX Batch 2 will include marked improvements in each of these key operational areas.

The contract, announced on 9 February, follows the initial prime contract awarded to the then BAeSEMA and its partner Signaal for the CMS (combat management system, KDCOM), fire control, two target tracking and illumination radars, the medium range radar, the combat system databus, and links to all other combat systems for the Batch 1 KDX. Development was completed to time and specification for the RoKN's formal acceptance of the *King Kwanggaetto* (KDX 01) last May. Two more ships will follow this year.

The new contract calls for three 10 console CMS hardware shipsets (two more than KDCOM), additional databus terminals, and new CMS software to accommodate the new Korean Naval Tactical Datalink system (KNTDS), towed array surveillance system (TASS), towed acoustic countermeasures (TACM) and surface-to-air missile (SAM) system. Upgrades to existing functional software for electronic warfare (EW), identification friend or foe (IFF), inertial navigation system (INS), and systems engineering and combat system integration support are also included.

Roger Barnes, managing director Sea Systems in Land and Sea Systems, said: "This significant follow-on order continues our work in Korea and places us in a strong position for future combat system orders both in the UK and overseas."

Samsung Electronics Corporation is BAe's Korean industry partner and will be responsible for undertaking licensed production of command system hardware and the combat system databus for KDCOM 2.

The Batch 2 KDX combat system will feature the US-supplied Standard Missile 2 Block IIIA area defence missiles fired from a Mk41 launcher (VLS). The aperture of the STIR tracking radars used on KDX Batch 1 will be upgraded from 1.8 to 2.4 dishes to accommodate the extended engagement envelope of the SM2. The well-proven Tracor WDS 14 will serve as the missile fire control system, and Daewoo Telecom will supply the TASS and TACM systems for ASW.

The CIWS (close-in weapon system) capability is reduced from two to one Goalkeeper AAW unit in order to accommodate a newly added short range SAM system. Israeli Aircraft Industries (Barak-1), Raytheon (RAM) and Thomson-CSF (Crotale NG) are competing to supply the SAM system.

The Batch 2 KDX is a larger ship – 5,000 tonnes – with an extended anti-air missile system and enhanced ASW and inner-layer defence capabilities. The new contract extends SSCS ability to manage more than 40 different combat systems, backed up by in-service applications software including long range AAW capabilities. The system is designed to be flexible enough to accommodate the most up-to-date technology using existing databus architecture.

The datalink will be supplied indigenously, and most likely will resemble the Link 11 datalink system. The new CMS contract also includes considerable additional interfacing and functional software, including improvements to the Batch 1 Threat Evaluation and Weapon Assignment (TEWA) package.

The US Navy will assume responsibility for the AAW system integration under its Foreign Military Sales contract, but will subcontract a subsequent agreement with BAe for AAW combat system integration with the KDCOM 2 CMS.

Six Batch 2 KDX vessels are planned by the RoKN, with Daewoo Heavy Industries expected to share future construction with Hyundai. An even larger 6,000-tonne Batch 3 KDX is projected after 2005.

Royal Marines' fast insertion craft surfaces in northern Norway

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A rarely seen UK Royal Marines fast insertion craft was towed ashore in Norway in late January following an accident which occurred during a routine training mission off the coast of northern Norway. Intended for use by special forces, the vessel is thought to have a top speed in excess of 50kt. The vessel sustained light damage in the accident.
(photo: Troms Folkeblad, Norway)

Russian corvettes to Vietnam

Vietnam is to receive 2 modified Tarantul II (Type 1241 RE) corvettes from Russia's Vympel joint stock company over the coming months. The 455-tonne corvettes, designed for tropical operations, will join two Tarantul I ships witch have been in service with the Vietnamese Navy since 1996.

The new corvettes will be equipped in much the same way as the earlier ships with two twin launchers for the 45n miles (72.4km) range SS-N-2D 'Styx' missile, the Igla air defence missile, a 76mm AK-176 gun and two 30mm AK-630M air defence guns.

The newly acquired ships will augment the navy's capability to conduct shore-based operations in coastal waters, as well as operations in the South China Sea, where disputes over claims to the Spratly Islands continue to promote regional instability.

To date, the former Soviet Union/Russia has exported 24 Tarantul I and II class corvettes to the following countries: Bulgaria (two); Finland (one); the former (East) German Democratic Republic (five); India (five); Iraq (one); Poland (four); Romania (two); Yemen (two); Vietnam (two).

Vietnam is also considering acquiring Project 12418 ships armed with quadruple Kh-35 (SS-N-25 'Switchblade') missile launchers.

The acquisition of the Tarantul II class corvettes is Vietnam's most recent initiative aimed at supplanting its poorly equipped navy.

In December 1998 it was reported that the Vietnamese Navy acquired two second-hand, North Korean built mini-submarines, which are being refurbished at the Cam Ranh Bay naval base (see *Jane's Defence Weekly*, 9 December 1998, p14).

Details of the submarine deal are not known. However, indications suggest that the submarines are Sang-O class, or possibly Yugo class, midget submarines.

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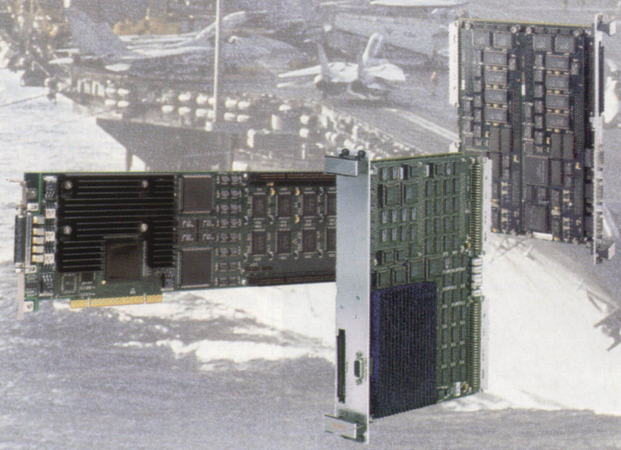

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Horizon stalemate continues

By Josh Corless

A clear shift in priorities within the UK component of Project Horizon is beginning to emerge, and the future of Project Horizon – the warship component of the Common New-Generation Frigate (CNGF) – is hanging in the balance.

As tensions continue to rise between UK, France and Italy over basic issues of the industrial and managerial framework for Project Horizon, the UK has sent its clearest message to date that it is prepared to withdraw from the £8 billion (US$13.3b) project.

In a 25 January statement, Parliamentary Under-Secretary of Defence John Francis Spellar said: "Clearly, if rapid progress on the issues is not forthcoming, we would need to consider the option of alternative strategies, including a national warship, to ensure the Royal Navy's requirement is fulfilled."

This sentiment was echoed by Sir Robert Walmsley, chief of defence procurement, on 3 February when he said that the Royal Navy "is not going to wait for ever. I'm not going to be in charge of a shipbuilding programme which goes through a series of further indefinite delays."

The Under-Secretary's comments come on the heel of the 14 January meeting of the Project Horizon Steering Committee in Paris, where according to the Ministry of Defence (MoD), no final decisions were made regarding the withdrawal of the UK from the CNGF programme.

An earlier meeting held on 10 and 11 December to evaluate the International Joint Venture Company's most recent reformulation of the contract framework, which places overall leadership with Marconi Marine, the combat system prime on DCN International and the platform prime with Orizzonte, broke up without resolution.

Since last October, the UK has been appealing for more progress to be made on the prime-contracting management competence of the consortium. Meanwhile, UK Secretary of Defence George Robertson refuses to sign the contract for the Principal Anti-Air Missile System (PAAMS) contract negotiated with EUROPAAMS (comprised of Eurosam and UKAMS) in October.

An MoD spokesman said: "We are looking for a successful outcome [on Project Horizon]. Our overriding interest remains the rapid establishment of a strong prime contractor and a robust supporting industrial structure."

However, time is running out. The UK Royal Navy has an urgent requirement for 12 CNGFs to replace its ageing fleet of Type 42 destroyers from 2005. At a cost of £75 million (US$125m), the UK seems little closer to fulfilling its requirement for an affordable next-generation frigate than it was a year ago. In addition, as the UK MoD's position on 'smart procurement' continues to harden, the threshold for further delays and expenditures is likely to diminish.

The financial, managerial and industrial aspects of the collaboration have yet to form the basis for an effective transition to design and production – a fact that might ultimately lead the UK to withdraw from what is potentially Europe's largest defence collaboration.

News in brief

● Rheinmetall increases stake
Rheinmetall Industrie GmbH is now the majority shareholder of STN ATLAS Elektronik, following the recent acquisition of the 25% holding belonging to the German electric power producer Energie Baden-Württemberg AG (EnBW). Rheinmetall now holds 51% of STN ATLAS stock, with British Aerospace holding the remaining 49% of shares.

● Siemens powers Type 212s
The Siemens Marine Engineering Subdivision will be supplying the propulsion and distribution system and all of the integrated on-board automation for the next-generation Type 212 submarines to be built at the Italian shipyard Fincantieri Cantieri Navali. The contract, worth nearly DM57 million (US$34m), includes the PERMASYN motor for use with the GSC supplied AIP system. Siemens has already been contracted to design and supply the electrical systems of the four Type 212 boats ordered by the German Navy.

● RN awards ECS contract
Lucent Technologies and DaimlerChrysler Aerospace UK have won a major order for 45 DEFINITY Enterprise Communication Servers (ECS). The ECS will be ruggedised to withstand extreme operational conditions – installation of the DEFINITY ECS also makes UK Royal Navy on-board communica-tions interoperable with other NATO allies. DaimlerCrysler Aerospace UK will provide project management, over-seeing the delivery of Lucent Technologies hardware and operator training, beginning this year and ending by March 2002.

● Dolphin delivery postponed
Due to recent modifications requested by the Israeli Navy, the delivery of the first of three Dolphin-class submarines, built by the HDW-led German Submarine Consortium (GSC), has been delayed. *Dolphin*, the first-of-class, was set for delivery this month, followed by *Leviathan* in May, and *Tekuma* next February.

Carrier concerns

Only 48 hours after it left its home port of Brest for 10 days of initial sea trials, France's new nuclear-powered aircraft carrier (CVN) *Charles de Gaulle* returned to port due to a fault in one of its auxiliary electrical engines. The French CVN, which was originally due to enter service in 1995, was unable to conduct speed trials as a result of the malfunction, according to the French Navy.

The 40,000-tonne vessel is currently undergoing an initial 15 day diagnostic carried out by DCN engineers is Brest. According to DCN, the faults that prevented the carrier from conducting its full-range of trials were not related to the software faults which prevented the carrier from putting to sea last October.

The exact cause of the mechanical problem is not yet known. Depending on progress in Brest, the 15 day diagnostic may be extended in order to fully ascertain the nature of the failure. DCN will be issuing a brief to the French Navy upon completion of the engineers' assessment.

Sea Skua contract awarded

Sea Skua will arm Kuwaiti fast patrol craft. *(photo: BAe)*

Matra BAe Dynamics (MBD)has placed a multi-million pound, two year contract with French shipbuilders Constructions Mécaniques de Normandie (CMN) to manufacture missile canisters for the ship-launched Sea Skua missiles to be supplied to the Kuwait Naval Forces. The first batch of canisters will be delivered later this year.

Kuwait has acquired the ship-launched version of the Sea Skua for its eight CMN designed P-37BRL fast attack craft. The P-37BRL is a derivative of the CMN's Combattante I design, and is armed with an OTOBreda 40mm gun, a GIAT 20mm gun and four MBD Sea Skua missiles.

This new contract is a follow on from the co-operation agreement entered into in 1994 between CMN and MBD to develop combat system integration solutions for light warships, using Sea Skua and the vertically launched Sea Wolf naval missile system.

Canada's evolving role in SACLANT poses questions

Sharon Hobson examines the impact of the revised NATO command structure on the Canadian area of responsibility and where this might lead Canadian sailors.

Under the new NATO command structure Canada is no longer responsible for an area of the western Atlantic ocean, prompting some analysts to wonder if the country is being marginalised within NATO.

The restructuring is part of the alliance's transformation from an organisation that was originally structured for the defence of Europe, to one that is able to deal with future crises and threats that arise beyond the traditional European area.

Under the old structure, Canadian Rear Admiral Duncan Miller, Commander of Maritime Command Atlantic (MARLANT), was a Principle Subordinate Commander (PSC) responding to the Commander-in-Chief Western Atlantic (CINCWESTLANT), under Supreme Allied Commander Atlantic (SACLANT). The revised structure has removed that permanent third level of command: the PSCs. The fact that Canada lost a command responsibility in this reorganisation is being downplayed by the navy.

Canada was offered a headquarters, but turned it down. "We could have been a full-blown NATO headquarters with NATO staff, like Northwood [UK]," says Rear Adm Miller. "We said we don't need that. We are happy with our [Rear Adm Ken Summers] being on SACLANT's staff and [as Chief of Staff] organising the whole Atlantic, with us playing a major role in it." To Canada it makes more sense for NATO to augment the Halifax, Nova Scotia, headquarters on an as-needed basis, rather than maintain a permanent NATO staff there.

Under the old structure, Adm Miller was Commander of Canadian Atlantic Area (CANLANT), but under the new structure, the area disappears and he becomes Commander Canadian Forces Atlantic – a NATO Force Structure Headquarters.

Admiral Miller says that with the removal of the geographic boundary, Canadians could be sent anywhere to do anything, and could be assigned resources from any of the NATO commanders. "The agreement I have with SACLANT," says Adm Miller, "is that he can make me a Deputy Joint Force Commander to CINCWESTLANT, for example, if he wants to make CINCWESTLANT the Joint Force Commander for the protection of shipping to mid-Atlantic. Likewise he could make me the Joint Force Commander and I could have a German deputy."

"I expect to be the Joint Force Commander in the Northwest Atlantic." Rear Admiral Duncan Miller, Commander of Maritime Command Atlantic (MARLANT). (photo: Canadian DND)

Admiral Miller acknowledges that the loss of the CANLANT sub-area can be seen in a negative light, but at a recent Allied Commanders Atlantic conference he took a positive view of the changes.

"The fact that we are not entirely within the same chain of command gives us more flexibility as opposed to less ... and I expect to be the Joint Force Commander in the Northwest Atlantic." Miller says that SACLANT agreed with this interpretation.

"It's a navy which the US wants us to use not off Halifax, but off Dubrovnik. SACLANT is preparing packaged forces for overseas deployment. He's not here to patrol Sable Island."

Others, however, do not. Dr Danford Middlemiss, a defence analyst at Dalhousie University, says: "It's sad because it reflects Canada's diminished influence and role in the alliance." He also calls the navy's loss of a command area "ironic because the navy is the part of our contribution to NATO that is still active and relevant." Canada withdrew its brigade group and fighter squadrons from Germany in 1993.

In his discussions with SACLANT – Admiral Harold Gehman – Adm Miller emphasised that the Canadian Forces Maritime Command has significant capabilities. "We're not just a little squadron up here working out of Halifax, we can actually run a mini-war." In fact, Adm Miller exercised this capability last June when he was the Joint Force Commander in an annual Canadian maritime exercise, MARCOT 1/98, reporting directly to SACLANT.

The exercise involved 40 ships, 100 aircraft, and 15,000 naval, land and air personnel from seven NATO countries. The exercise included naval surface warfare, convoys, mine countermeasures, amphibious operations, electronic warfare, tactical helicopter operations, anti-submarine warfare, air superiority and peace support operations.

Dr Joel Sokolsky of the Royal Military College in Kingston, Ontario, does not think that Canada is becoming marginalised. He says Canada's strongest link to NATO is its naval commitment "except that we have to understand that it's not here to protect North America, or to protect the sea lines of communication. The thrust is to support the exercise of force ashore", which is in accordance with the US Navy's *From the Sea* naval strategy.

With 12 *Halifax*-class frigates, four *Iroquois* -class destroyers, and the forthcoming delivery of four ex-UK *Upholder* submarines, Canada will have the most effective navy that it has had in 40 years. "But it's a navy which the US wants us to use not off Halifax, but off Dubrovnik," says Dr Sokolsky. "SACLANT is preparing packaged forces for overseas deployment. He's not here to patrol Sable Island."

The new structure reflects SACLANT's new global perspective. NATO is no longer just focused on the North Atlantic.

When the Standing Naval Force Atlantic (STANAVFORLANT) operated in the Adriatic in 1993, Adm Miller said "that was the first indication that it doesn't matter where the STANAVFORLANT operates, it still operates within the NATO chain of command, and it can be in the Adriatic, it can be in the Indian Ocean, it can be anywhere." ■

When two sides go to war...

The Royal Navy's 'Thursday War' work-up is regarded as the most realistic multi-threat, multi-warfare training serial in the world. Richard Scott examines the interaction during a typical anti-air warfare exercise.

Tension is high aboard HMS *Newcastle*. The UK Royal Navy (RN) Type 42 destroyer, as Commander Task Group (CTG) 603.01 is leading a seven-ship force in the waters off the small Gulf state of Vodenia amid the threat of imminent air attack.

TG603.01's mission is to escort a high value unit, the auxiliary oiler replenishment ship RFA *Fort Victoria*, on a pre-set navigational track. To accomplish this it must counter the air, sea and sub-surface threats deployed by Heronia, a rogue state which has subjected neighbouring Vodenia to continued aggression in defiance of international law. The UK has pledged to support Vodenia, deploying RN vessels into the potentially hostile waters of the Persian Gulf.

Operational intelligence has given the ship a good indication of the threats it faces. The Heronian order of battle includes two surface action groups equipped with long range surface-to-surface missiles, two Kilo-class diesel-electric submarines, and a powerful air component. The latter includes F-4E Phantoms armed with C-801K 'Sardine' air-launched anti-ship missiles, F-5E Tiger II fighters with AGM-65 Maverick missiles and MiG-29 'Fulcrum B' fighter ground attack aircraft equipped with bombs and rockets. Last, but by no means least, is the threat posed by a C-801 'Sardine' coastal missile battery.

***Newcastle* has been at action stations since the early hours. Commanding officer Commander Steve Kenny is up on the bridge. Below decks the ship's command team is closed up, hooded and gloved in anti-flash gear. The cramped operations room is darkened apart from the amber glow of displays and various panel buttons illuminated in red, white and yellow. Chatter between the various compilers and supervisors, linked into internal voice circuits by their communications headsets, is audible but calm. The screens in front of them are filled with clusters of labelled tracks.**

The concentration in the ops room is intense. And that is no surprise. Earlier this morning, *Newcastle* came under attack by Heronian MiG-29s while▶

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Work starts equally early for the other side of 'Thursday War'. A misty dawn is still breaking over the south coast of England as aircrew and mission systems operators from FR Aviation sit down for their pre-flight briefing. Meteorological conditions, air traffic notifications, exercise area activity, routings and recovery plans are all imparted to the three crews present.

So too are the precise details of the operational taskings which will be flown to facilitate the anti-air missile defence component of 'Thursday War'. This calls for the acquisition of those ships participating in the exercise, the employment of stand-off ECM, and the provision of missile threat simulation to test the responses and exercise the abilities of ships' sensor operators and command teams. Formed in 1985 to operate special mission aircraft under contract to the UK Ministry of Defence, FR Aviation (part of the Cobham Group) is currently contracted to provide over 4,500 hours per year of aerial services – encompassing threat simulation, electronic warfare training and target towing – for the RN.

Nine out of FR Aviation's fleet of some 20 specially adapted Falcon 20 jets (modified to incorporate an internal ESM and VHF/UHF communications jamming [COMJAM] fit plus interchangeable external podded mission payloads), are used to service RN requirements. Each Falcon 20 carries a crew of three: the pilot (or captain), co-pilot (first officer) and a rear-seat electronic warfare operator (EWO). The aircrew are a mix of experienced ex-military fast jet pilots and some younger civilian pilots, while the EWOs are all military-trained former navigators or observers.

Aircraft assigned to the RN are tasked by the Fleet Support Air Tasking Organisation (FSATO) at Yeovilton, which is also responsible for providing trade for a fleet of 15 Hawk T.1/T.1A two-seat trainers based at RNAS Culdrose. These diminutive but nimble aircraft, government-owned/contractor-operated by Hunting Aviation, work in tandem with the Falcon 20s during 'Thursday War' to replicate the flight profile of an inbound anti-ship missile.

Each mission undertaken for 'Thursday War' is precisely planned to fit into the FOST script. Air assets,

▶transiting a defensive minefield. Although constrained in its ability to manoeuvre in the narrow swept channel (just 600 yards across) the ship escaped undamaged. One of its consorts, the Type 23 frigate HMS *Northumberland*, was less fortunate. Hit in the bridge by bombs and rockets, *Northumberland* suffered a number of casualties, but prompt action by damage control and fire-fighting parties recovered the ship.

Hostile electronic countermeasures (ECM) activity – more often than not the portent for another attack – is now causing interference on the ship's Type 1022 D-band long range air search radar. The Anti-Air Warfare Officer (AAWO) has already called Air Raid Threat Red, putting the ship on the highest level of alert for an anticipated inbound raid.

The shrill blast of a whistle tells all that a tell-tale radar emission has triggered a warner channel on the UAA(2) electronic support measures (ESM) system. The operator makes his call.

"APQ-120 radar! Bearing two-seven-zero." "Track correlates to F-4", reports the Electronic Warfare (EW) supervisor. UAA(2) has picked up a Phantom's radar as it searches for a target.

"ZIPPO CHARLIE!" The AAWO's alert call sets off a chain of well-rehearsed routines inside the ops room. A probable missile attack is being counted down. The ship will have just seconds to react.

To all intents and purposes, this could be the Gulf. The rules of engagement, tactical procedures and command responses being executed are authentic. The air targets being tracked by *Newcastle's* radars are real. Even the ESM 'rackets' are accurate mimics of real threat emitters.

In fact, this is not the Gulf but the South Coast Exercise Areas (SCXA) in the English Channel. *Newcastle*, now into week five of its six-week Basic Operational Sea Training (BOST) programme, is participating in 'Thursday War', widely regarded as the most realistic and exacting multi-threat, multi-warfare training serial in the world. And▶

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"ZIPPO CHARLIE!" The raid is counted down inside *Newcastle's* ops room (left). (photo: Royal Navy)

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Falcon 20 callsign Amber 1 formates with Hawks' Blue 1 and Blue 2 before beginning a threat simulation run. (photo: Richard Scott)

masquerading as forces from fictional Heronia, are required to run in according to pre-designated flight profiles, achieving a precise time on target in order that the exercise serial appears seamlessly real to those on board ship.

Threat emitter simulations must be coordinated with the inbound Hawks, in order that the time-to-target is representative of a real missile threat. And jamming must be targeted against designated victim radars so that the ECM and emission control procedures instigated by individual system operators can be effectively assessed.

At 0820 the first of three Dassault Falcon 20 jets rolls down the runway at Bournemouth International Airport (BIA). Callsigned Amber 3, it rises above the mists and climbs out en route to the SWXA. A little over 30 minutes later two more Falcons taxi out from FR Aviation's apron on the north side of BIA. Amber 1 is first to take off, followed five minutes later by our aircraft, callsign Amber 2, with FR Aviation's head of operations Capt Mike Gray at the controls.

Each of the three Falcon 20 aircraft carries a different external load on its four underwing hardpoints. Amber 1 is configured with an ATRS-5 threat emitter simulator on each inboard pylon and E/F-band ALQ-167(V) radar jamming pods on its outboard stations.

Amber 2 also carries two ATRS-5 threat simulator pods, plus an I/J-band ALQ-167(V) jammer on its port wing and a D-band ALQ-167(V) pod on the starboard side. Amber 3 has E/F-band and I/J-band ALQ-167(V) jammers on its respective port and starboard inboard stations, with BOZ 3 chaff dispensers under each outboard pylon.

This morning's FSATO tasking calls for the simulation of threats encountered in the Gulf theatre, specifically the combination of F-4 Phantom and C-801K 'Sardine' long range anti-ship missile (ADEX 451). Later in the day, the Falcon 20s will be called upon to simulate an attack from a shore battery of C-801 missiles (ADEX 450). Designated targets

▶ **so-called because it happens every Thursday.**

BOST is run by the Devonport-based Flag Officer Sea Training (FOST), the organisation charged with conducting operational sea training for all RN surface ships and supporting auxiliaries manned by the Royal Fleet Auxiliary (RFA) Since its inception in 1958, the various FOST training syllabi have been continuously updated to reflect the significant changes in the role and composition of the fleet. Lessons learnt in both peace and war have been incorporated into a syllabus book, containing a wide range of sea training packages.

Ships are put through BOST in order that they are fully prepared for both current and contingent tasks in peace, war and whatever lies in between. The first week is taken up by harbour-side training, followed by a progressively more demanding programme of sea training serials designed to develop, test and hone the competency and efficiency of individual ship's departments and to teach the ship to operate as a team. These exercises build up from relatively low-level stand-alone serials to more complex multi-layer exercises, with warfighting and damage control elements being gradually superimposed. This process culminates in the weekly 'Thursday War' serial, where each ship is tested as a complete fighting unit in a realistic and highly pressurised multi-warfare environment. Each individual training serial is carefully scripted to reflect the operational level of a ship at any given point in its BOST programme.

Aside from RN and RFA ships, FOST now services the operational sea training needs of several other NATO navies, notably Germany, Greece, Italy, the Netherlands, Portugal and Turkey. Other training packages are tailored to suit the needs of non-NATO navies, usually on the back of UK defence sales agreements.

FOST's accrued expertise is brought to bear through a resident staff of 140 Sea Riders, a mix of lieutenant commanders, warrant officers and senior rates who have been hand-picked for their individual experience and proficiency in a particular operational discipline, engineering or logistic trade. They are embarked at sea with two purposes in mind: first, to oversee, advise and evaluate the performance of the ship's company; second, to▶

Ready for action. *Newcastle's* upper decks are manned in anticipation of an inbound raid. (photos: Photo Press/H.M. Steele/Richard Scott)

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comprise the Type 42 destroyer HMS *Newcastle*, leading TG603.01, and the Type 23 frigates HMS *Northumberland* and HMS *Iron Duke*.

Amber 3's slightly earlier departure from BIA gives it time to lay a chaff pattern out to the west of the task group. Chaff remains a bugbear for radar operators and the enlarging corridor will give them something to think about. It could be masking an attack. Or it could be a deception tactic.

Chaff is still being deployed when three Hawks from Culdrose (callsign Blue 1, Blue 2 and Blue 3) give TG603.01 a rude awakening. ADEX 449 simulates a bomb and rocket attack by MiG-29 fighter ground attack aircraft, the Hawks unmasking late from the nearby headlands to make a series of weaving approaches at low level as the force navigates the swept channel just outside the Plymouth breakwater. HMS *Northumberland* bears the brunt of the attack.

Amber 1 and Amber 2, flying at an altitude of 8,000 feet, are by now well en route to the SWXA. On board Amber 2, co-pilot Adam Firth inputs positional co-ordinates and time of arrival information into the aircraft's GPS-based navigation system. Air traffic control is switched from BIA to Plymouth military radar.

Having flown across south Devon and past Plymouth, the two Falcon 20s carry on to the Cornish cathedral city of Truro before banking to port and following a south-westerly course out over the English Channel. Shortly afterwards visual contact is established with Amber 3 and Hawks' Blue 1 and Blue 2 (radio and radar silence is maintained as far as possible to simulate combat conditions).

Dropping down to 4,000 feet, the five aircraft manoeuvre into their attack 'V' formation. Amber 1 and Amber 2 are out in front, separated by a distance of about one mile, with Blue 1 and Blue 2 respectively tucked up in close formation beneath each Falcon's starboard wing.

Amber 3 follows about a mile behind. It will maintain radar and communications jamming sequences throughout the run while the aircraft pairs ahead execute their threat simulation profiles. The multi-mode VHF/UHF communications jamming will be adjusted to disrupt ship-to-ship communications, forcing each unit to fight based on fall-back communications procedures.

At a pre-designated latitude/longitude some 65 miles to the west of the Task Group, the five aircraft pass

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▶ **orchestrate a pre-planned sequence of events and enactments.**

BOST culminates in the fifth and last 'Thursday War', a final inspection during which the ship is pushed to its limits as a fighting unit in a realistic action state. That test is another week away for *Newcastle*. But the Sea Riders still have plenty up their sleeves, as the ship's company is about to find out...

The inbound raid: Amber 1 carries both ALQ-167(V) jamming pods and ATRS-5 threat emitter simulators *(top)*; the EWO activates the ATRS-5 programmed to simulate an APQ-120 radar *(middle)*; the Hawks prepare to 'launch' at 40 miles out *(bottom)*.(photos: Richard Scott)

Two fast moving targets are now being tracked inbound by *Newcastle's* Type 996 surveillance and target indication radar. Tracks 1344 and 1345 were quickly correlated to the ESM intercept. The Principal Warfare Officer (PWO) – the senior tactician in the ops room – must now decide on the tactical actions to be instigated to deal with the anticipated threat.

Each Phantom releases its single C-801K missile some 40 miles out, the separation showing up clearly on radar. *Newcastle's* Type 909 I/J-band target illumination radars try to lock on to the launch aircraft to engage with Sea Dart missiles.

At a range of about 20 miles each C-801K's own active radar seeker begins to search. The distinctive electromagnetic fingerprint is picked up by the UAA(2) system. The PWO orders the launch of distraction chaff in an effort to lure the inbound missiles onto a false target. As the missiles continue to close seduction chaff and floating decoys are deployed.

The ship manoeuvres to minimise its radar cross section. Close-in weapons are brought to bear.

"MISSILES INBOUND! BRACE! BRACE! BRACE!"

For the purposes of 'Thursday War', *Newcastle* does not come through unscathed. A Phalanx close-in weapon system has hit the one incoming missile, but not far enough out to prevent large pieces of debris coming inboard. Fragment damage on the port side has killed four sailors, injured several others and started a fire in the paint shop. There is a slow flood in the 4.5inch gun magazine, and damage to the junior rates' mess.

The 'wreckers' – those Sea Riders versed in the arts of damage control and firefighting – go to work on 2 Deck. The darkened passageway is filling▶

through a positional gate at 240kts to begin their first run of the day.

The target is HMS *Newcastle*, whose most recent position has been radioed through by Plymouth military radar. On board Amber 2 it is the responsibility of EWO Adrian Tuite, an ex-RN fixed-wing observer, to detect *Newcastle* electronically and begin a sequence of jamming and threat simulation from his console in the Falcon 20's rear cabin.

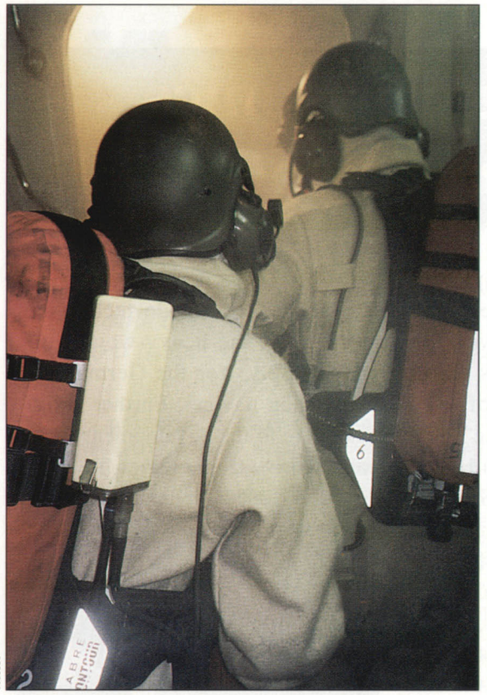
This customised operator interface – indeed the entire EW mission suite – has been designed, developed and integrated by FR Aviation own EW engineering facility using off-the-shelf components sourced from a variety of contractors. Elements include a composite B-J band ESM suite (integrating a Condor Systems direction finding system and CS-8101 control unit, a Comptek Emitter Feature Extractor (EFE) and a Tektronix 494AP spectrum analyser), a Tracor Flight Systems 100–500MHz COMJAM set, and a PC control panel (PCCP) for the external radar jamming and threat simulation pods.

A PC-based planning system allows the EWO to pre-programme the EW mission plan, which is then loaded into the PCCP on a computer diskette. However, most operators – and Tuite is no exception – use the mission plan as no more than a baseline for the sortie, preferring a 'hands on' approach which allows them to exploit the real-time emitter information available to them to best effect in their chosen jamming responses.

Newcastle's Type 1022 D-band radar is the first victim. Using the EFE and spectrum analyser to analyse the emitters characteristics, the low-band ALQ-167(V) pod is tuned to produce a noise jamming signal superimposed onto the radars current operating frequency.

At a range of 55 miles from the target the EWO activates an ATRS-5 pod, programmed to mimic the characteristics of an F-4E's APQ-120 radar in typical search/acquisition mode. The emissions last for about 30 seconds.

The two Hawk 'sea-skimming missiles' are launched at 40 miles, plummeting down to altitudes as low as 50 feet and accelerating to a speed of over 450kts. Amber 1 and Amber 2 throttle back at the same time in order to accentuate the separation and to give an accurate



▶ with acrid smoke as initial attempts to extinguish the paint shop fire are defeated. Although wearing breathing apparatus, the first damage party on the scene has been beaten back by the flames. Their only option is to retreat, securing the hatchway behind them to seal the compartment.

Meanwhile, an injured rating is brought out of another forward compartment. His arm has been made up to simulate severe burns. Both the wound and his agonising screams are uncomfortably realistic. Minutes tick by. A fully-equipped five-man firefighting party is now preparing to re-enter the blazing compartment. But they have been far too slow and the Sea Rider in attendance is not impressed. It is well over 10 minutes before they are ready to open the hatchway and attack the fire. That will have to improve before the ship's final inspection.

Which is precisely what 'Thursday War' is all about. Honing the ship's overall capability as a fighting unit by practising warfighting tactics and procedures in the most realistic fashion. Later in the day, *Newcastle's* crew will have to deal with the threat posed by Kilo-class submarines (played by the German submarine *U 24*), Heronian surface forces (in the shape of NATO's Standing Naval Force Atlantic) and a shore-based 'Sardine' missile battery. They will sustain more battle damage and also have a conventional weapon incident thrown in for good measure.

A week later, *Newcastle* completed BOST with its final inspection rated as very satisfactory. And less than two months after this particular 'Thursday War' serial, the ship – "worked up and ready to go" in the words of Cdr Kenny – was deployed at short notice to a theatre which the crew were already familiar with. The Persian Gulf. ■

A firefighting party re-enters the 'blazing' paint ship on *Newcastle's* 2 Deck. The smoke is in fact produced from an N5/N6 smoke generator canister (photo: Richard Scott)

simulation of a live missile launch to the radar operators on board ship. Jamming in the I/J-band is then initiated to prevent air defence systems from engaging the launch platform and/or the simulated missiles. The high-band ALQ-167(V) pod is capable of a variety of noise and deception modulations.

"Ten miles to run." A short radio message from Blue 2 is the cue for the EWO to activate the other ATRS-5 pod, in this case programmed to simulate the active radar seeker head of a C-801K missile. In actuality, most anti-ship missiles will switch on their seeker heads with about 20 miles to run to target. However, given the lower speed of the Hawk in relation to a C-801 missile, the response time for *Newcastle's* operations team will be about the same.

Blue 1 and Blue 2 press home their attacks, with both Falcon 20s continuing the threat simulation inbound until overhead. Once *Newcastle* has been overflown, the Hawks climb to formate once more with Amber 1 and Amber 2 and begin preparations for a new run. This time *Iron Duke* will be the target.

Not every aspect of warfare can be realistically simulated in ADEX 451. Altitudes and attack ranges are governed by airspace rules and are general rather than threat specific. Safety considerations demand strict guards for communications jamming (safety frequencies must be protected), and care must also be taken to avoid jamming civil radars.

However, these are relatively minor concessions. FR Aviation, tasked by FSATO and operating in concert with Hunting Aviation's Culdrose-based Hawks, plays an important role in maximising the RN's training value during 'Thursday War', exercising personnel in aircraft tracking and correlating in a hostile ECM environment, stretching air defence and weapon control teams, and by testing unit reactions to an anti-ship missile threat.

Effective training turns a ship and its crew into a fighting unit. Out in the Gulf today, *Newcastle's* crew – on task and operational – are all the wiser for their 'Thursday War' experience. ■

"Worked up and ready to go." *Newcastle* was deployed to the Gulf at short notice just weeks after this 'Thursday War' serial. *(photo: HM Steele/Jane's)*

STN ATLAS: A leading electronics and systems engineering company

STN ATLAS Elektronik GmbH, Bremen, with its Naval Systems, Simulation Systems and Land and Airborne Systems divisions and its subsidiary STN ATLAS Marine Electronics GmbH is one of the leading German companies in the field of electronics and systems engineering.

Technological activities at STN ATLAS range from signal processing to radar technology, navigation and communication, hydroacoustics, sonar and high-frequency technology, optics/optronics through to unmanned aerial vehicles, digital visual systems (virtual reality) and command and weapons control systems. Based on its wide-ranging systems capabilities, the company also acts as prime contractor for system management, integration and logistics tasks in various areas.

The Naval Systems division is one of the leading national and international manufacturers of sonar equipment and integrated command and control systems for submarines and ships, minehunting and Vessel Traffic Services systems (VTS), underwater vehicles as well as naval weapons.

Products concern all types of sonar equipment, both passive and active, used on submarines and surface ships. Amongst others, these include not only shipboard sonar units like the cylindrical 360-degree bow sonars and flank array sonars for submarines but also active and passive towed array sonars.

Apart from Systems engineering integrated command and weapon control Systems are a further area of key competence. The integrated command and weapon control Systems ISUS for submarines and COSYS for surface vessels offer high value for the money invested: They enable the ship's command to fulfill all objectives for tactical and strategic mission decisions including the full range of command from tactical navigation, threat analysis and weapon engagement.

Prime contractor experience is available for all activities from the first feasibility studies to the delivery of the fully equipped ships.

Modern mine hunting sonars are other areas of key competence. The know-how in the fields of navigation and communication forms the basis for success in the field of civil VTS (Vessel Traffic Services).

Reusable and single-shot mine disposal vehicles do also belong to the broad scope of know-how for naval needs. These systems are equipped with a fiber-glass cable link to the carrier platform for purposes of data transfer and control.

STN ATLAS is one of the world leaders in the torpedo technology sector (e.g. the heavy-weight torpedo DM2A3 for the German and Norwegian navies). Further activities relate to the development of advanced drive technologies for torpedoes and torpedo defense measures.

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Offboard sonar charts a fresh course for ASW

The Anti-Submarine Warfare sonar system of the next century could be a network of expendable arrays that use wideband communications to alert weapon platforms and direct them to a target, as David Foxwell and Richard Scott explain.

The post-war history of the development of ASW sonar has been a story of the development of active, and then of passive sonar. In the last decade, as submarines have become quieter and ambient noise levels higher as the focus of interest in ASW has moved inshore, so the effectiveness of passive towed array sonar has diminished, and attention has focused once again on the use of active sonar.

This has taken the form of the development of a new generation of active low frequency towed sonar systems, examples of which are now under development in Europe and in the US. Already however, the concept of operations originally envisioned for this new generation of ship-borne low frequency sonar has been superseded, and on both sides of the Atlantic, research and development (R&D) into the ASW sonar system of the next century is focusing on quite a different approach.

In a 'network centric' ASW sonar system, transmitters and receivers aboard individual surface ships and submarines will be but a part of a much wider network of sonar dispersed across a wide geographical area, expanding the 'ASW battlespace' beyond the range of conventional ASW sonar systems. The next-generation ASW sonar could thus be described not so much as an ASW sonar system, but a 'system of sonar', spread across an entire task force.

Under this concept of operations, a group of widely distributed offboard sensors would act as a single sonar system which was organic to a group of ships, rather than an individual platform. In such a distributed or 'multi-platform' sonar, detection would be automatic, beam-forming would be adaptive, the sonar would 'probe' the environment with adaptive signals, and the sonar system would 'map' the ocean automatically. Such a system would also adapt by selecting its own operating envelope, without recourse to an operator.

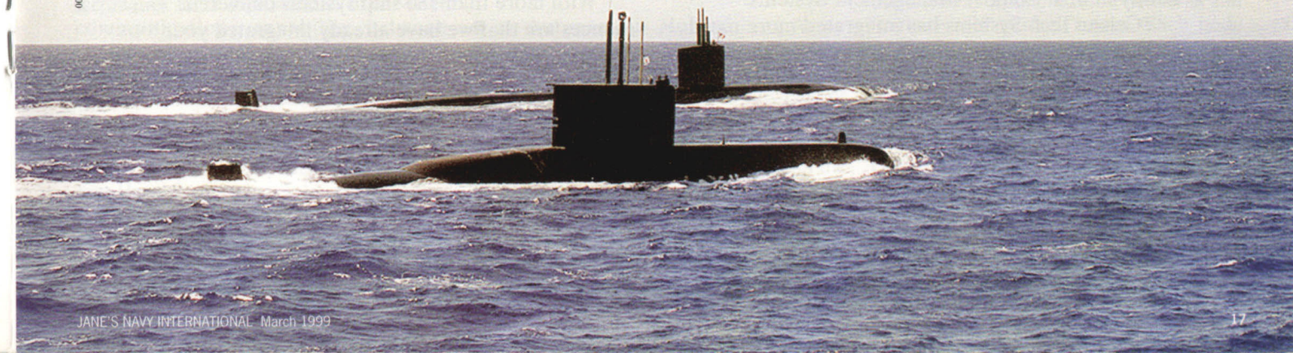
Achieving this goal will require the development of advanced 'in sensor' processing; a new generation of underwater communications; and above-water, high data rate communications. It will also rely heavily on the development of affordable arrays – probably fibre optic – and on advanced broadband processing techniques.

Remote sensors: going offboard

Typifying this renewed interest in off-board sonar is the Advanced Deployable System (ADS), and a number of recent Broad Agency Announcements (BAAs) from the Office of Naval Research (ONR) in the US seeking proposals for applied research in a range of autonomous sensors. ADS is a transportable acoustic surveillance system designed to be deployed prior to the arrival of a battlegroup in-theatre' (see *JNI* June 1997, p21). The Mission Needs Statement for ADS, which could be deployed from a variety of platforms, dates from 1992. Currently, Low Rate Initial Production of ADS is scheduled for early in the next century.

As Nancy Harned, team leader for the ONR's Undersea Surveillance Signal Processing Program, explains, the BAAs are a response to the growing requirement in the US Navy for low cost fixed or drifting sensors. Capable of operating simultaneously with minimal operator intervention, autonomous arrays such as

The US Office of Naval Research is seeking proposals for a range of off-board and deployable sensors, which would be capable of being deployed, monitored and commanded by a variety of platforms including aircraft (such as the P-3C Orion seen here monitoring the activities of two submarines), unmanned aerial vehicles, surface ships, and submarines. (photo: US DoD)



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these would extend the ASW battlespace significantly compared to that obtainable with ship- or submarine-mounted sensors. The benefits they would provide would thus be twofold: making up for any shortage in the number of ASW platforms available; and spreading sensors across a wider area, making the most of the useful signals available in shallow water.

Capable of providing continuous surveillance over wide geographic areas, the sensors would communicate detection alerts to post-processing sites – or directly to ASW units – using acoustic communications, RF links, and satellite communications (SATCOMs).

Harned says that the ONR is seeking proposals for a range of off-board and deployable sensors, which would be capable of being deployed, monitored and commanded by a variety of platforms including aircraft, unmanned aerial vehicles (UAVs), surface ships, and submarines.

LFA and Passive Automation are enhancing the performance of SURTASS for littoral/shallow-water operations (photo: Hughes Aircraft)

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Major Challenges

Key topics of interest to be addressed in the proposals include both acoustic and non-acoustic sensing; active and passive 'in-sensor' signal processing; lightweight, low cost, low power expendable drifting and fixed sensors and arrays; and low cost sensor and array manufacturing techniques. Proposals for sensor deployment systems for use from UAVs, unmanned underwater vehicles (UUVs), surface ships and submarines are also being sought.

Also of interest to the ONR are proposals that address the other major technical challenges involved in developing offboard, autonomous sensors, such as remote acoustic and radio frequency communications for data and command relay with airborne platforms and undersea vehicles. Data fusion techniques and technology capable of disseminating sensor data and cueing other ASW assets, and supporting the re-detection and engagement of targets, is also required.

An Advanced Technology Demonstration at the ONR is being used to examine techniques for a sophisticated underwater communications capability between surface ships and submarines. Other applied research projects are exploring techniques that would enable autonomous arrays to communicate with one another. 'Pop-up' buoys could be used to transmit sensor data to post-processing centres, says Harned.

The sensor concepts that the ONR hopes could be supported by the successful development on in-sensor passive signal processing techniques include:

- an Autonomous Drifting Line Array (ADLA), comprised of a very low frequency array of 30–100 hydrophones forming a near linear horizontal aperture or a vertically tilted and ocean current curved, multi-dimensional aperture. This continuous or split-aperture array would be beamformed as a function of its changing geometry (which it would itself sense), and VLF broadband and narrow-band acoustic energy would be analysed to develop a 'detection message'. The ONR anticipates that detection/classification information would be relayed to a post-processing site – or directly to a tactical unit – using a cellular-like (1.2–0.6kbps) RF data link. The same two-way link would also support processor/controller remote mode selection, so that in-sensor processing could be modified to suit specific operational or environmental situations. High priority events – such as detection of a target – could also trigger the use of larger data packages and communication band-widths (64–1,024kbps), but at the expense of reduced battery lifetime;

- an Autonomous Moored Line Array designed for use in shallower waters (200–1,000m), in which the array is fixed to the seabed. The geometries of this type of array might include near-straight horizontal line arrays on the bottom; a 'V' array, comprised of two or more line arrays on the bottom with different deployment azimuths, using a common anchor; and a weakly buoyed slack line array with considerable vertical and horizontal aperture. The ONR says in-buoy processing for these notional arrays might include matched field processing for target depth determination, but would have to support low bandwidth contact data communications by way of combined acoustic and RF techniques;

- a Fixed Shallow Water Surveillance Barrier Line, with processing capable of automated detection, classification, and localisation, for use in very shallow water (50–300m). Arrays of sensors of this type would form 'tripwires' or barriers. The barriers would be spaced – typically in the order of hundreds of metres apart – according to prevailing ambient noise levels and signal fields, and the type of acoustic propagation encountered in the area. According to the ONR, barrier technology is being sought which would be amenable to deployment from surface, sub-surface, and airborne platforms, such as the ONR/Naval Air Warfare Centre X-Glider;

- field nodes – for use in shallow water (150m–500m) – would be deployed in distributed fields for area surveillance, and use acoustic communication networks and 'gateway' RF surface buoys. Each node might have three to five directional acoustic sensors moored vertically off the bottom and have a detection/classification footprint with a greater area than a barrier line. The nodes, which would have to be capable of automatic detection, classification and localisation, could also be configured with magnetic and electric field sensors. Bearing in mind the longer ranges and propagation complexities involved, the ONR says classification for

such a field node could be a much more difficult issue.

To complement the passive detection capability, the same sensors would also be capable of in-sensor active acoustic signal processing, and thus allow them to be used in a bi-static or multi-static arrangement. Coherent acoustic sources that could be used with the ADLA could thus include the Low Frequency Active (LFA) Surveillance Towed Array Sensor System (SURTASS), Long Endurance Low Frequency Active Surveillance (LELFAS) system, an air-dropped, lightweight version of LELFAS, or an Air Deployed Low Frequency Projector.

The US Navy's SSQ-110A series sonobuoy, or a similar broadband VLF device could provide an incoherent or broadband 'echo ranging' capability. A typical coherent multi-static scenario could make use of several sources and as many as 50 receivers distributed over as wide an area as possible.

Shallow water environment

Using low frequency sources in shallow water is more challenging still, because all sorts of features – such as sub-bottom trenches, schools of fish, and deep draught surface ships – can produce false targets (see *JNI* June 1996, pp10–15). To overcome these problems, broad-based research in ocean acoustics is being used to obtain a better understanding of the effects of the ocean environment on underwater acoustics, and to assess and predict how the underwater environment impacts upon the performance of ASW sonar systems.

The 'ocean environment' includes three-dimensional, evolving features, such as the air-sea interface, sub-surface bubbles and plumes, so-called 'volume effect' (such as internal waves, fluctuating media, pollutants, fronts and eddies), the interface with the seabed, and ocean bottom and sub-bottom regions.

In the field of active sonar signal processing, much effort is being directed towards the development of more sophisticated signal processing techniques for target detection and classification in bottom-limited, shallow water environments. Research and development is focused on low frequency (below 1kHz) and mid-frequency (1–5kHz) signals, on classification of low-Doppler targets, and clutter suppression techniques based on waveform design or adaptive signal processing.

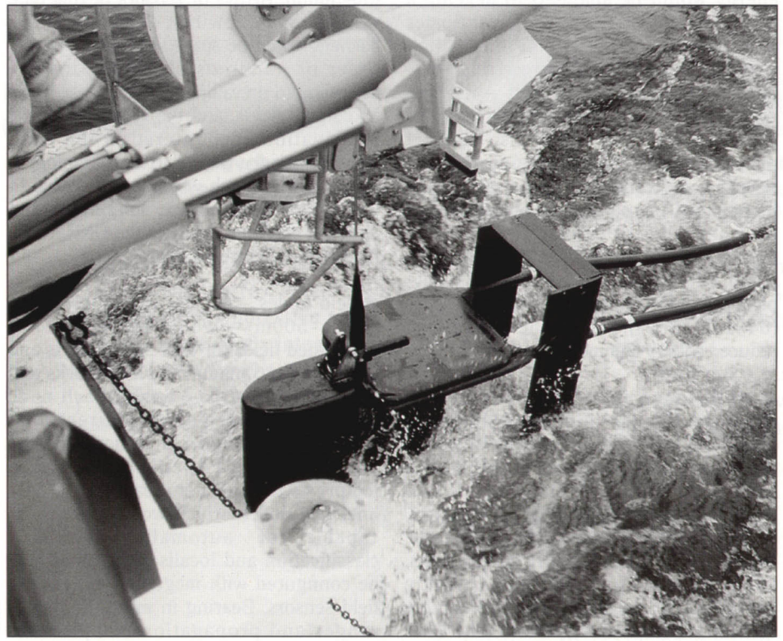
Low frequency sources

As Dr David Randalls, a technology manager in the Underwater Sensors & Oceanography division of the UK's Defence Evaluation & Research Agency (DERA) explains, several types of low frequency projectors are in development around the world which could form the basis of the next generation of low frequency sound source. The key, says Dr Randalls, is obtaining the required source level and bandwidth in a manageable volume. New transduction materials, such as magnetostrictive and electrostrictive materials, and transducers that make use of a range of rare earth metals could be suitable says Dr Randalls, but none is seen as perfect for job.

Nancy Harned at ONR agrees that magnetostrictive and electrostrictive materials offer promise, as do low frequency transmitters that make use of a combination of the two technologies.

In the UK, free flooded ring technology is being proposed for the UK Royal Navy's Sonar 2087, and another approach that has been addressed by ONR – the Barrel Stave Projector – is being studied in Canada as part of that country's Towed Integrated Active & Passive (TIAP) programme. Working with Sparton of Canada, the Defence Research Establishment Atlantic has been examining a number of low frequency projector arrays suitable for use in TIAP, and has elected to pursue development of a Horizontal Projector Array based on BSPs.

The LELFAS mentioned above is an active offboard source that is due to be demonstrated under the US Department of Defense's Fiscal Year 1999 Advanced Technology Demonstration programme. This low-cost, affordable, rapidly deployable, long-endurance, low frequency acoustic source is designed to provide undersea surveillance in littoral waters and in the open ocean, pending the arrival in-theatre of US Navy SURTASS LFA ships with their AN/UQQ-2 sonar. With dimensions around half that of a Mk48 heavyweight torpedo, LELFAS could be deployed from a range of platforms, including submarines, providing the same kind of capability that was sought in the 'Pilotfish' programme, an active source for use by a submarine in a bi-static system.



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The LFATS system: a complement to future ONR sonar concepts such as ADLA (photo: AlliedSignal).

Getting more from broadband

Broadband signatures have been exploited for a number of years, but are growing in importance with the increased emphasis on detecting submarines in acoustically challenging shallow water conditions. As Nancy Harned explains, in the shallow water environment, acoustic propagation is highly variable and it is necessary to look at a much wider range of frequencies in order to successfully detect and classify a target. Much effort is therefore being directed towards the development of broadband sound sources and into broadband signal processing techniques.

Likewise, broadband sensors and processing are being developed to guide and control ASW torpedoes in shallow water and to overcome the effects of reverberation, single and multiple-boundary scattering, false targets, and false alarms caused by biological, geological, and boundary features. For this application, robust and highly capable combined broadband sensors and processing systems are required that are robust and highly capable in order to provide efficient target detection, a high level of resistance to countermeasures, and a high level of target resolution and classification.

According to the ONR, a spin-off of the development of broadband sensors and processing technology of this type, could be its use in the design of diagnostic tools to detect and classify features in the ambient environment, and new types of guidance and control systems for UUVs.

Torpedo defence

Defence against torpedoes has become a major pre-occupation for most navies and a number of national and international torpedo defence programmes are already under way, such as the US Navy Surface Ship Torpedo Defence (SSTD) programme, the multi-national NATO SSTD project, the Franco-Italian SLAT (Système de Lutte Anti-Torpille) programme, and the new UK National SSTD programme.

In the longer term, long range science and technology programmes are being used to provide the means to develop more effective defence for surface ship and submarines. Technologies of interest include those capable of performing detection, classification and localisation of incoming torpedoes, and detection and classification of targets with low signal-to-noise ratios. Technology is also being sought by the major navies that could defeat salvoes and air dropped torpedoes, as are technologies capable of providing a quick reaction capability against incoming – possibly very high speed – torpedoes at ranges of less than 2,000m of a capital asset.

Fibre optics

Work on an all-optical towed array, and on fibre optic flank array sonar has been under way on both sides of the Atlantic for many years, including a fibre-optic version of the US Navy's Wide Aperture Array (WAA), which is significantly lighter than the original version that uses conventional transducers. More recently, the Naval Research Laboratory (NRL) in the US has said it is interested in receiving proposals

Final bids for Sonar 2087

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Sea trials aboard the NATO research vessel, the *NRV Alliance*, have validated Indal Technologies' towed body design for Sonar 2087. (photo: Indal Technologies)

Later this year, the UK Ministry of Defence will award a full development and initial production contract for the Royal Navy's new Sonar 2087 low frequency active/passive sonar system, after choosing between rival bids from Babcock Defence Systems and Thonson Marconi Sonar Limited (TMSL). System development and downstream production is estimated to be worth around £350 million (US$582m) to the winner.

Sonar 2087 – being procured to meet Staff Requirement (Sea) 7590 – is intended for retrofit to all 16 of the Royal Navy's Type 23 frigates (supplementing the Sonar 2050 medium-frequency set and replacing the Sonar 2031Z very low frequency passive array). The system will combine a variable depth low-frequency transmitter (operating at frequencies down to 500Hz) and a wide aperture passive towed reception array (operating down to 100Hz). The first system is due to enter service in 2004.

Contractor teams led by Babcock Defence Systems and TMSL have each completed an 18-month project definition (PD) phase under the terms of parallel £10 million (US$16.6m) contracts awarded in April 1997. This followed an earlier 21-month feasibility study and risk mitigation phase, in which a team led by what was BAeSEMA, also participated.

As originally constituted, the Babcock 2087 Team brought together Babcock Defence Systems (as prime contractor); Northrop Grumman (responsible for active sonar, data processing and displays); Cogent (outboard system integration); Basys Marine (passive array); BMT Reliability Consultants Ltd (life cycle cost modelling); IBM Defence & Aerospace (combat system integration); Indal Technologies, (towed body and handling system); and STN Atlas Elektronik and PMES (both sonar design support).

Last year, this multinational team was further strengthened by the appointment of Lockheed Martin Ocean, Radar and Sensor Systems as design agent and system integrator.

The rival TMSL grouping is building on experience derived from Sonar 2050, the abortive Sonar 2057 passive towed array requirement (subsumed by Sonar 2087), the Active Towed Array Sonar and Combined Active/Passive Towed Array Sonar families of export Low Frequency Active Sonar, and others. TMSL is prime contractor, systems design authority, and responsible for risk management, platform integration, inboard subsystem design and towed array design; its French sibling, TMS SAS, is outboard system design authority; Marconi Marine (YSL) Limited is taking responsibility for naval architecture aspects, ship integration and seaworthiness; and Orincon is responsible for data processing and performance.

PD activities have included demonstrations of the outboard (towed body and handling system) elements of the respective solutions. Both bidders are understood to have defined transmitter solutions using free flooded ring technology. As a deliverable of the PD phase, tenders for the full development and production of an initial six Sonar 2087 ship set (two pre-production and four production), together with contractor logistic support (CLS) to Fleet Weapon Acceptance in May 2007, were submitted on 4 February. Price options have also been entered for further production batches of six and four ship sets, and further periods of CLS.

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An example of multi-static ASW using offboard source with towed array and deployable receivers. (source: US ONR)

for the development of new types of sophisticated fibre optic technology. The technology includes analogue communication systems and optical microwave links, digital communications links, generic fibre optic sensors (both interferometric and intensity), and the signal processing of fibre optic signals.

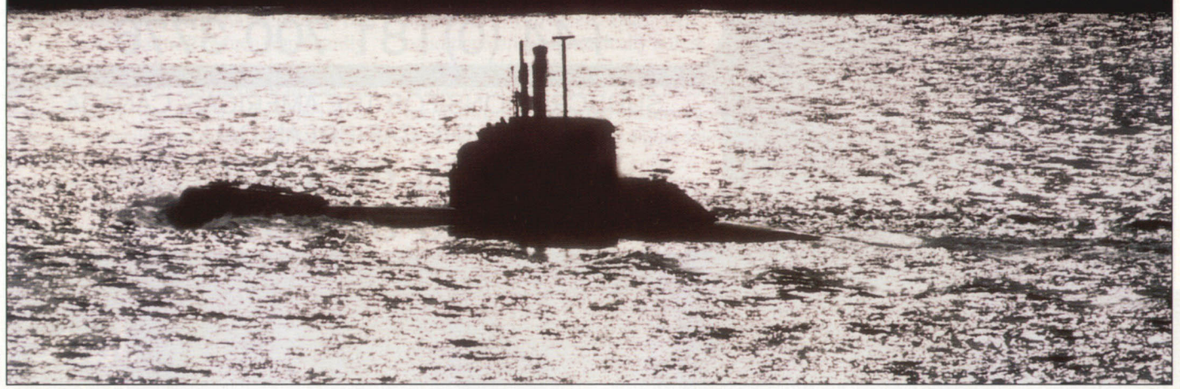
The NRL is also seeking innovative concepts for component and sub-system development that can improve the performance of existing systems, or generate new applications of fibre optics. It says that major areas of interest are large bandwidth laser diodes (or external optical modulators); high speed detectors; local area networks; and acoustic, magnetic, chemical and strain sensors. Given that the fibre optic cables in question in some remote sensor systems may only be 0.2–0.05 inches in diameter, survivability of the array is seen as the greatest potential risk to their use. Consequently, R&D is under way to develop means of protecting them.

In the US, funding is being made available to develop and test the capability to protect fibre optic micro-cables by burying them beneath the seabed. Future undersea surveillance systems employing fibre optic micro-cables and acoustic arrays based on them could therefore be deployed from a towed deployment vehicle operating close to the seabed. Another advantage of burying acoustic sensors based on fibre optic micro-cable is that doing so will produce a straight, linear array which will enhance the ability of the system to beam form, and detect targets.

As DERA's Dr Randalls explains, fibre optics are receiving renewed attention because they could form the basis of a new generation of ultra-thin line towed array. Like the US, the UK has its own optical array programme. As targets become quieter, says Randalls, longer arrays with a larger aperture are required, but cannot easily be accommodated within a submarine, and the amount of room available to stow an array effectively limits its length. Early types of submarine towed arrays could be 'clipped on' to a submarine, but submarines operating close to the shore in shallow water will need to be able to reel in their arrays.

Aboard submarines and surface ships alike, there is also pressure to accommodate a new type of multi-dimensional or

The shift in operational environment from open-ocean to littoral waters, coupled with advances in submarine quieting systems and weapons performance, poses significant challenges for the next generation of ASW sonars. *(Photo H M Steele/Jane's)*



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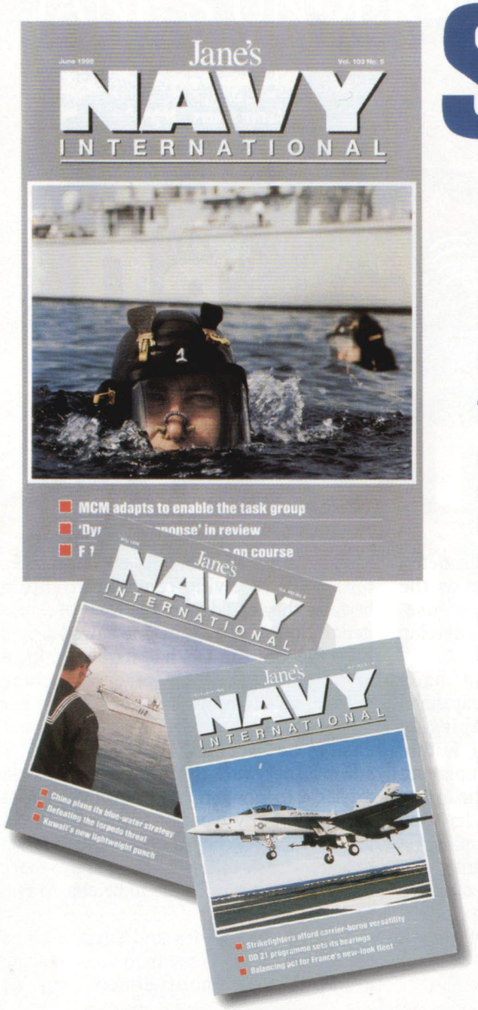

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'volumetric' arrays – multi-line arrays with more than one line of transducers. Although shorter than conventional arrays, volumetric arrays would also consume valuable space aboard a submarine unless produced using fibre optics, but are important because they are more effective than single line arrays in shallow water.

Volumetric arrays of this type have been under development for a number of years. A volumetric array with five lines of transducers – which was intended for use from US Navy submarines – completed development four to five years ago, and although it is not yet in service, it was said to provide a dramatic improvement in detection and classification capability in shallow water.

Another advantage of fibre optic technology is that it is well proven, and mass production to meet commercial requirements in the telecommunications industry could make the next generation of fibre optic sonar comparatively inexpensive to produce. Currently, says Nancy Harned, conventional towed arrays are, effectively, hand-built, making them too expensive to consider using in an expendable array.

The "fish" of SLASM, the Thomson Sintra A31F integrated sonar system, seen on the stern of the French Navy's *Torville*-class destroyer *De Grasse (photo: Peter Howard/Jane's)*

Adapting to the environment

The US Navy has already embarked on the early stages of a research and development programme, the aim of which is to develop the capability to provide the next generation of ASW sonar with the ability to adapt to their environment. Similar R&D is included in the DERA science programme in the UK.

According to Nancy Harned at ONR, the requirement for environmentally adaptive sonar reflects the fact that there are few historical databases of the shallow water environment, and the fact that the shallow water environment changes so quickly in time and space. In developing sonar that can sense and adapt to their environment it is hoped that sonar performance and effectiveness will be enhanced, and that operator workload will reduce significantly.

Existing sonar have become complex and difficult to use with hundreds of modes and waveforms for the operator to select from, although typically, operators might only use a handful of them. In deep water, sonar operators are used to using convergence zones to detect submarines and provide an 'ASW screen', but in shallow water there is no convergence zone, conditions change rapidly, and detection ranges are shorter.

In the US Navy, it is acknowledged that the effects of shallow water will also limit the effectiveness of the next-generation sonar, although the Lightweight Broadband Variable Depth Sonar (LBVDS) – which is being developed for the DD-21 land attack destroyer – will have some environmentally adaptive features. The LBVDS is due to be tested aboard a surface combatant in 2002, and in the meantime, existing sonar are expected to be upgraded with enhanced signal processing and more computing power to give them an environmentally adaptive capability.

For ships such as the DD-21, the ASW problem is compounded by the requirement that surface combatants conduct many other operations - such as theatre ballistic missile defence - that do not provide them with the option of using speed or manoeuvrability to avoid detection by a submarine.

In these circumstances, short detection ranges can leave a surface combatant vulnerable to attack. Given that in the shallow water environment the sonar operator cannot rely on the effectiveness of existing sonar, environmentally adaptive sonar are required that will 'sense' conditions and automatically adjust without operator intervention. Such a 'smart sonar' would build up a model of its local environment through repeated observations and use this model to optimize signal selection.

National programmes

Many other countries are also developing low frequency active sonar. British Aerospace is continuing to market the Active Towed Array Sonar (ATAS) which was previously jointly marketed with Thomson Sintra – now part of Thomson Marconi Sonar Limited (TMSL) – and sold to the navies of Taiwan (the V(2) version with a Lamproie towed array), and Pakistan (the basic V(1) variant). The passive-only V(0) variant and the top-of-the-range V(3) system (with facilities for simultaneous active and passive operation) are also available.

Weighing 8 tonnes overall, ATAS V(1) comprises a low frequency (3kHz) transmitter based on 'flextensional' transducer technology and an in-line receive array. The latter features a cardioid processing technique to resolve left/right-bearing ambiguity. A range of product enhancements has been incorporated in the improved ATAS II which is now being marketed. These centre on the incorporation of a new processing architecture and a flat-panel operator console, using the latest commercial off-the-shelf processing technology.

STN Atlas Elektronik has also developed a compact, lightweight Active Towed Array Sonar, which operates at around 2kHz, TMSL has its Combined Active/Passive Low Frequency Sonar 20, while L3 Communications has its Low Frequency Active Towed Sonar. France and Germany have agreed to collaborate on the development of their next generation sonar. The Royal Australian Navy also has a requirement for low frequency active towed sonar, trials of which are due to start in two years time. The Royal Netherlands Navy, although not yet committed to an acquisition programme, has conducted extensive trials with its experimental LFA system. ■

Navies play their part in peace support operations

The first decade of the post-Cold War period has seen the identification of a new class of military operations as international organisations – notably the United Nations – have been able to work a little more as they were intended to do by their founders. Other regional organisations have established themselves as having a greater role in the maintenance of peace and security in various areas of the world.
ERIC GROVE studies the part navies play in international peacekeeping.*

Traditional 'peacekeeping' — the placing of observers and/or lightly armed forces between warring parties seeking to maintain an uneasy truce — has been expanded into a grey zone sometimes called wider peacekeeping. In such an instance, the reaction of the warring factions to the presence of the peacekeepers may be more volatile. In such situations, peacekeepers might be called upon to assist in demobilisation operations, to escort humanitarian relief, to guarantee or deny movement, or to assist civil authorities in reforming security forces, developing infrastructure or ensuring smooth power transitions between various groups.

In some cases the consent of the warring parties has disappeared and the intervention forces have engaged in 'peace enforcement' — more directly military operations where the warring parties have been subject to military action to force them to abide by the terms of a settlement. This form of intervention then merges with the military enforcement of UN resolutions against aggressors, as defined by the Security Council. This is a form of hostilities, one of the few sanctioned by current international law and is probably best not considered a 'peace' operation at all. The qualitative, doctrinal difference between peace enforcement and peacekeeping cannot be over stated, however difficult this distinction may be to draw.

A warship is often the preferred method of participating in international peace support operations. Here the UK Royal Navy's aircraft carrier HMS *Invincible* comes alongside (viewed from the USS *George Washington*) during Operation Southern Watch in the Persian Gulf. *(photo: US DoD)*

The expectation that UNPROFOR (United Nations Protection Force) in Bosnia could act as a peace enforcement organisation was always unrealistic. The transition to the more belligerent IFOR (Implementation Force) and SFOR (Stabilisation Force) was a necessary result of the move from wider peacekeeping to peace enforcement. This important difference has led to an evolution in terminology. Primarily, the term 'peace support operation' was coined as a term to cover all forms of military activity associated with the impartial assistance in the creation and the maintenance of a long-term political settlement between third parties, and the achievement of humanitarian goals in a conflict. The term 'wider peacekeeping' has subsequently fallen into disuse, with a clearer distinction being made between peacekeeping and peace enforcement. UK Royal Navy doctrine, as explained by the author of this article and his colleagues in BR1806, *The Fundamentals of British Maritime Doctrine* (HMSO, 1995; to be re-issued in revised form in 1999), categorises three different applications of maritime (or any other form of military) power:

- military or combat governed use, where combat is used or threatened;
- constabulary use, where forces are used to enforce law or implement some internationally mandated regime (violence only being employed as a last resort); and
- benign use where the specialist capabilities and skills of forces are used for such purposes as disaster relief.

Peace support missions can take the form of any or all of these forms, and are often good examples of the problems that such missions may encounter when force is used in more than one of these basic forms, either consecutively or simultaneously. Benign tasks may have a constabulary or even military dimension; constabulary tasks may deteriorate into enforcement. The need for maximum flexibility and adaptability is paramount to the concept of maritime versatility — one of the seven 'principal attributes', as defined in BR1806.

The types of peace support operations that are currently envisaged are:

- peacekeeping — 'classical' interposition activities to facilitate and monitor the implementation of cease fires, or more substantial agreements pursuant to Chapter 6 of the Charter with the consent of the belligerent s;
- peace enforcement — coercive operations under Chapter 7 to maintain or re- establish the mandated peace;
- conflict prevention — preventative deployments, fact finding missions, and operations to warn, inspect and monitor;
- peacemaking — military support to ongoing diplomatic activities aimed at establishing a cease fire or more permanent peace;
- peace building — actions to support political settlements by improving well being and confidence, and the support of economic and physical reconstruction; and
- humanitarian operations — action to relieve the human cost of conflict, often in support of specialised relief agencies.

Maritime forces can make important contributions under all these headings. If sanctions and/or an arms embargo are part of the peace process, naval forces can monitor a sea area and, under the right mandates, engage in the boarding and diversion of ships carrying contraband. More classical peacekeeping by interposition is more problematic in the maritime context, as the conflicts in which peacekeeping is relevant usually take place in man's preferred habitat — on land. Nevertheless, in certain littoral and riverine environments, water based platforms may play an important role.

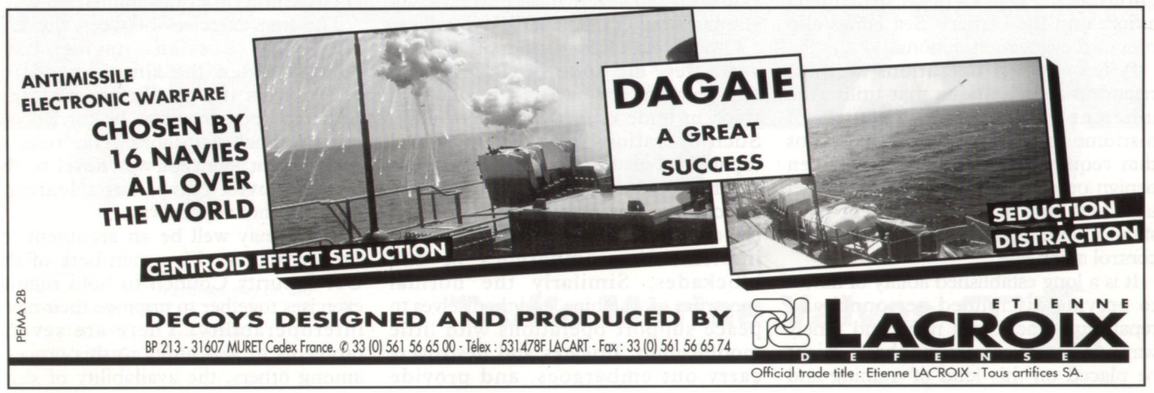
A classic example of naval peacekeeping was the activities of the unarmed, white-painted Argentine *Baradero*-class coastal patrol boats in the Gulf of Fonseca in 1991–2 as part of the ONUCA (United Nations Observer Group in Central America) peacekeeping force in Central America. These boats monitored movements in the Gulf and by their presence, acted as an impediment to breaches of the cease fire, especially illicit arms shipments between Nicaragua and El Salvador. There was an important water based component to the UN forces in Cambodia, where rivers form major thoroughfares; the Cambodian Navy was taken under UN command in 1992–3 and its assets painted white for use by UNTAC (United Nations Transitional Authority in Cambodia). Additional vessels were acquired to maintain a fleet of 39, used by almost 400 multinational naval observers and marines. The UNTAC flotilla was used for river and coastal patrols, for transport of UNTAC ground components, to monitor the cease fire and the presence of illicit forces, to monitor and supervise the cantonment and demobilisation of the maritime forces of those party to the peace agreement, and to prevent the movement of arms by water. Arms were carried by this force for self-defence.

Maritime assets can of course be used on or over land itself. Carrier aircraft are useful assets to police no fly zones, or to provide a particularly useful form of air cover on a contingency basis. Maritime helicopters can be used from land or sea as a particularly flexible form of supportive air power for movement in theatre, humanitarian aid or casualty evacuation. Marine forces can be used as part of the forces deployed on land, and to maintain an integral amphibious capability in theatre. Either in suitable harbours or poised at sea, naval assets can give a more secure logistical base which can also be used for the rapid evacuation of peacekeepers, aid workers or other endangered personnel in a deteriorating situation.

In many parts of the world, seaborne acres might be the only access available. In this case, seaborne platforms might well be the most effective and available means of deploying medical, logistic or humanitarian supplies. In this context, it is worth remembering that 70% of the world's population live within 100 miles of the sea.

The many faces of 'peace support' include peace enforcement, as carried out by these F-14B Tomcats from the USS *John C. Stennis*, enforcing the 'no-fly' zone over Iraq. *(photo: US DoD)*

* *Eric Grove is Deputy Director, Centre for Security Studies, University of Hull in northern England.*



Other roles that maritime assets might be called upon to fill within the spectrum of peace support operations are assistance to seaborne refugees, provision of a neutral platform for peace negotiators and the clearing up of mines and other explosive devices, an important task in post-conflict peace building. This latter task allowed the Japanese Maritime Self-Defence Force to carry out an operation in the Persian Gulf after Desert Storm. One of the most important attributes of maritime forces in a peace support context, is their capacity to poise in international waters, giving participants in a messy or potentially volatile peace support operation the ability to react to a rapidly changing situation as required.

National control

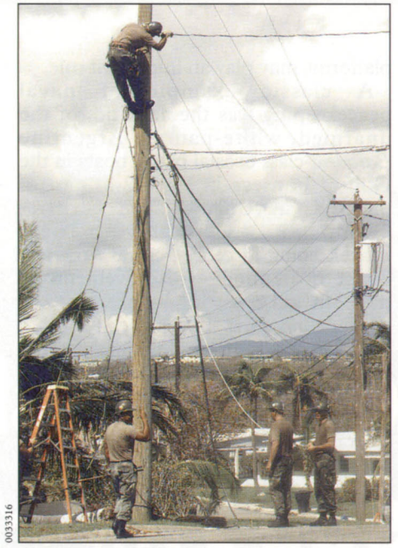
The activities of the UK aircraft carriers in the Adriatic in support of UNPROFOR provides a classic case study. The ships provided an air platform under purely national control, whose assets could be used as the UK government decided without reference, in the final analysis, to either NATO or the UN, or with the necessary support of any ally. This reassured decision makers and was perhaps a condition of the UK contribution to UNPROFOR.

In normal circumstances the activities of the carrier's aircraft were fully integrated with the NATO 'Deny Flight' operations, which covered a wide range of air activities over Bosnia. When particular danger threatened UK forces however, the carrier placed herself within range so her Sea Harriers could give necessary bombing support.

This was a major factor in deciding the carrier's programme and precise deployment. RAF assets based ashore in Italy always had to work under the conditions imposed by the Italian government. Use of naval helicopters ashore and the carrier's Sea Kings also provided evacuation options.

Peace support operations are best regarded as operations that utilise the inherent qualities and attributes of maritime forces, rather than operations that require particular training. Even benign operations such as disaster relief use skills that a fully competent navy should possess as a result of its damage control abilities.

It is a long established ability of navies to provide disciplined personnel and repair equipment in a rapid and timely way. At most, greater emphasis might be placed on this kind of training and



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US Navy Seabees work on power lines in the military housing area of a naval station on Puerto Rico. The lines were downed by the fierce winds of Hurricane Georges. Seabees were also tasked to clear roads and perform repairs to municipal buildings. *(photo: US DoD)*

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US Marine Assault Amphibious Vehicles come ashore at Port Ploce, Croatia, during an exercise. Croatia is typical of the type of region and circumstances under which navies will find themselves operating in peace support operations. *(photo: US DoD)*

the still wider dissemination and use of the skills developed in the Royal Navy's Disaster Training Exercise (DISTEX) establishment, now at Devonport in England. However, this is a matter of emphasis rather than a radical re-roling.

Other constabulary and more forceful activities, all under strict rules of engagement, are part of the standard stock in trade of any competent navy. Such operations help develop naval capabilities in useful ways, for example the rapid roping technique of using helicopters has greatly increased the effectiveness of boarding vessels to implementing embargoes or full blockades. Similarly the normal spectrum of warships lend themselves to peace support operations with little modification. Frigates and destroyers carry out embargoes, and provide presence for monitoring and observing. Carriers and amphibious ships have a clear relevance as do mine countermeasures vessels. Patrol vessels of various levels of reach are also available for operations of the Fonseca type.

The ability of navies to operate in a combined context also makes international maritime operations relatively easy. A warship is often the preferred method of participating in an international operation mandated by the United Nations. Its inherent reach gives it the ability to appear in theatre and it can be deployed on a more limited liability basis than forces ashore. It can be deployed flexibly on the basis of its capabilities and rules of engagement. Good examples are the placing of the Argentine destroyer in the least threatened part of the US carrier screen in Desert Storm, and the use of the German contributions to NATO's standing forces in a surveillance role (before the German re-interpretation of its basic law to allow actual action out of the NATO area.)

Interoperability at a high level is largely a function of the availability of technology. NATO's navies and the other allies of the USA provide a naval consortium integrated by Link 11 and other technology related to the well-established information revolution at sea.

Lessons have been learned from a decade of international integration to overcome problems such as the inability of the Atlantic and Pacific halves of the US Navy to be fully interoperable. At a simple tactical level, standards have been set by the issuing of the US's EXTAC publications to the widest possible audience.

Inevitably, the world's dominant navy has set the pace and provided the standards. There remain real problems in the integration of all the world's major navies into a common tactical doctrine and communications net.

The first exercises between the US, UK and Russian navies have demonstrated the simple need for interpreters if even the most simple embargo operation is to be carried out using normal radio links. The 'rules of engagement' concept was novel to the former Soviet Navy, but a learning process is now under way.

There may well be an argument for the Permanent Five members of the UN Security Council to hold regular exercises together to improve their naval interoperability. There are several problems in and limits to this process, among others, the availability of ships from Russia and China for distant deployment, and the tendency of at least the Chinese (and perhaps still, the Russian) and Anglo-US navies to see each other as potential opponents. However, the confidence building aspects of such enterprises would be useful in themselves .

Just as the Matchmaker exercises in NATO led on to the Standing Naval Forces, one might look forward to a Security Council Standing Naval Force, responsible to the Council through a revivified Military Staff Committee. Indeed, this is a most unlikely scenario for the revivication of this body.

In the meantime NATO provides the only available, well integrated combined force suitable for maritime peace support operations. The redefinition of NATO strategy in 1999 might well allow NATO forces to engage in peace support activities at some distance from their traditional area, even in Asian waters where other arrangements will be necessary (and where the chances of traditional naval combat are highest).

NATO procedures can also be used by forces available to the Western European Union, with or without direct NATO support, and it must be remembered that this organisation is at least notionally even less area bound than the new NATO. More ad hoc coalitions, either UN authorised or in a more classical peacekeeping context under the control of the UN Secretary General, are still possible. There has been an unfortunate tendency in the debate over peace support operations to think of them as being an expansion of traditional Article VI 'blue helmet' Peacekeeping, developed constructively but unconstitutionally when the Security Council was deadlocked by the Cold War.

Vested interests

There is now a large peacekeeping establishment and a set of vested interests that wish to keep the Secretary General in control of independent forces available for peacekeeping duties. Certainly many of the problems faced by UNPROFOR and other forces came from the totally inappropriate use of peacekeeping structures when the context demanded more forceful action. This has given peace support operations a rather bad name. This is probably a necessary correction to the over-committment of the last decade, especially in the first flush of the 'New World Order', but it should not lead to the denial of the need for joint forces to cover peace support operations.

At the highest level the UN has the potential machinery for a reformed military structure utilising the Military Staff Committee, which could provide a setting for the creation of meaningful politico-military authorities responsible not to the Secretary General, but to the Council itself. This would not be an independent 'UN Force', but a mechanism for the members to be able to project whatever collective power the situation demanded, provided a necessary consensus was acheived.

The contingency forces for use by any such arrangements include maritime forces and would be drawn from the normal navies of the member states as available. They would not be paid for by the UN but would operate in whatever combined units were required on the same kind of basis as the members of NATO standing forces do now. It must be remembered that NATO was set up by people who had just been giving serious consideration to a UN capability set up under the projected Military Staff Committee. Its formulas for combined operations are those that in all likelihood would have been used by the combined UN forces, as envisaged by the Charter.

This opportunity for more broadly based — and perhaps more legitimate — international maritime forces for the range of possible peace support contingencies deserves more exploration than it has received. As it is, maritime forces have demonstrated and will continue demonstrating their utility in peace support operations. Even if they do not operate in the environment where the peace is to be supported, their proximity rather than their presence can be turned to advantage in many ways. Peace support is not a special role but rather a context in which navies often find their most relevant use. It has provided contexts where maritime platforms have found new and stronger rationales. It was the Adriatic experience that, in part, helped prepare the way for the inclusion of two larger carriers in the 1998 UK Strategic Defence Review. Peace support is not a diversion from the other duties of navies, but the format in which their rationale is, for the present at least partly — and effectively — justified. ■

US must remain engaged worldwide – and agile

By Rear Admiral Robert Sutton, US Navy (ret)

R Adam Sutton ended his Term as Director, NIPO last November and retired from the US Navy on 31 January. The views expressed are his own and do not necessarily reflect US policy.

The post-Cold War era has offered the US unprecedented opportunities to create and solidify ties with political and economic allies and friends, as well as erstwhile adversaries. The National Security Strategy and National Military Strategy stress 'engagement' as a critical path to secure US interests – and the Department of Defense's (DoD's) international programmes provide many elements of that engagement. While grateful for the end of the Cold War, the US nonetheless finds itself preparing for the 21st century in a climate of political, economic, and military uncertainty. With world politics no longer bi-polar and the envisioned future threat asymmetric and dispersed, it is critically important that the nation remains engaged worldwide.

Three critical short-term realities confront the US Department of the Navy's security assistance business. First is the worldwide defence consolidation currently exacerbated by difficulties in the world's financial markets. Second, the accelerating and increasingly diverse high-technology solutions required to meet the threat. In this environment, the navy's international programmes must clearly link to US national guidance. Third, it is also necessary to successfully balance the often conflicting perspectives of the US State, Commerce, and Defense departments; partner governments and militaries; and the US and partner defence industrial bases as they navigate this uncertainty. The US Navy International Programs Office (IPO) sets out to ensure that its programmes:

- Support the US National Security Strategy and National Military Strategy, plus the regional strategies of the Unified commanders-in-chief (CINCs);
- Enhance interoperability and co-operation with allies, friends and partners;
- Promote cost-effective modernisation of US and friendly forces to increase coalition military power;
- Ensure the viability and effectiveness of the US and allied industrial bases to support shared political, economic, technological, and security objectives.

The importance of linking Navy IPO programmes with the theatre engagement plans and day-to-day business planning of the regional CINCs cannot be overstated. By linking its programmes with those of the other military services through the warfighting CINCs, the office contributes to consistent policies within the DoD and other parts of the US government. Additionally, it has assured linkages with the navy's systems commands, resulting in an integrated product team approach to international programmes.

Through a sustained business re-engineering effort and, most recently, designation as a 'reinvention Laboratory', IPO has put in place the architecture for a more agile and responsive organisation. Many of its programmes are improved, but much remains to be done. On the plus side, International Military Education Training (IMET) remains an unqualified success. Navy, Marine Corps, and Coast Guard schools, along with Mobile Education and Training Teams, train students from more than 154 countries annually. As well as addressing technical and operational training, IMET also exposes participants to the US military and the American way of life – with particular emphasis on resource management, military justice systems, codes of conduct, civilian control of the military, and the protection of human rights. No security assistance investment provides better returns for US 'engagement' in the long term.

"The importance of linking navy IPO programmes with the theatre engagement plans and day-to-day business planning of the regional CINCs cannot be overstated."

The IPO has instituted 'total package' support for the US Navy Department's Excess Defense Articles element through the Foreign Military Sales (FMS) Reserve Account Program. This provides 'new product' logistics support to current or out-of-inventory equipment which the office sells, leases, or provides on grant, thus making these proven systems much more attractive, cost effective, and sustainable – and a bridge to future high-technology solutions.

Since advanced technology has come to define the capability of a military to succeed in the modern battlespace, protecting critical technology from potential adversaries and sharing technology with potential military partners have become essential to national security. Technology transfer is an important element of international programmes as new technologies emerge around the world. Technology transfer to allies and friends ensures their ability to act with the US should the need arise, and can, at the same time, drive down the cost per unit of production while sharing evolutionary technology upgrades. Although complex and voluminous, the Navy IPO reviews about 11,000 visit, 17,000 publication, and 7,000 export-licence requests each year. The IPO office must continue to improve this technology security process, however, to meet the real needs of its coalition partners.

US allies are technologically advanced countries which expect to share the costs and risks of developing next-generation ships, aircraft, weapons, and equipment. This is why co-operative programmes are important today. At their best, these international agreements are win-win solutions which benefit the nation's collective defence capabilities and save scarce research and development (R&D) and procurement dollars. The result is greater interoperability between US forces and those of its potential coalition partners. The US is working hard on improving this process too.

Particularly important is the need for creative ways to capture the advantages of both weapon system direct commercial sales and the more traditional security assistance programmes. The Enhanced FMS Concept (FMS++) is an example of how aggressive partnering with industry, friends, and allies can combine the advantages of each and serve to reduce the financial exposure risk of a potential customer country. More flexible and potentially more responsive to a partner country, an example of a 'hybrid' or FMS++ case might be a co-operative agreement for joint testing and development, leading to combined manufacturing and sales directly from the manufacturer – with a traditional FMS package for logistics support. The 'creative packaging' FMS++ approach – where the customer country's preference is the solution set driver – holds the best hope for the continued success of navy international programmes.

Many challenges remain. The world economic and political environment includes a sometimes unlevel playing field in the international marketplace. Unequitable government subsidies for defence industries, barter systems for defence goods, or lack of statutory or legislative controls compound these difficulties. As the US moves into the 21st century, it will continue to deal with these challenges. One thing is clear – the commitment of both the US government and US defense industry in sustaining the articles that the navy IPO sells or transfers throughout their life cycle (while they remain in the service of the other country) is unequalled in the world. The IPO has come a long way in linking its engagement programmes to the US's strategies – in response to an uncertain geopolitical environment – and the office will continue to support US friends and allies, both by its forward presence when necessary, and by modifying its security assistance processes to be more responsive to them in the future. The framework thus established will serve the US well in the future. ■

VT consolidates support operations

BY PETER HOWARD

At the steel-cutting ceremony, left to right: Rear Admiral Richard Phillips (Assistant Chief of Defence Staff (Operational Requirements) Sea, Ministry of Defence; Martin Jay (VT Chief Executive) and Sir John Chisholm (Chief Executive, Defence Evaluation and Research Agency). *(photo: Vosper Thornycroft)*

A military Support Services group has been formed by traditional UK-based shipbuilding company Vosper Thornycroft (VT), as it moves further away from its reliance on the "knitting" of constructing vessels.

For some years VT (see *JNI* October 1998, p63) has increased its activities in support services and has established itself with valuable navy and army contracts. Over 40% of VT turnover in the first six months of the current financial year came from a wide range of engineering, logistics and training contracts.

Since 1996 support services had seen an annual growth of 50% each year and turnover from these contracts showed an increase of 78% in the last 12 months, VT Chief Executive (CE) Martin Jay told *JNI*. Of the contracts which had expired since VT moved into this field in 1992, there was a 100% retention record.

Looking ahead, Jay said: "Of the (UK) defence budget of about £22 billion (US$36.6b) we see a target market of support services of about £2 billion (US$3.3b) and the total outsourced so far is around £0.3 billion (US$0.5b) so there is much to aim for." Having diversified to protect the future, the CE said that his company still views itself as a major builder of warships – even though it was difficult to forecast the times of (UK) ship replacement and governments were looking for 'cradle to grave' and 'total ship management'.

Jay said he felt sure the UK Ministry of Defence (MoD) wants competition for future programmes – and he said this before the world learned of the British Aerospace purchase of the Marconi defence elements from GEC.

"It is important to do what the customer wants – and it is a good idea to have more than one potential frigate builder." The getting-together of two major owners has almost certainly improved VT's prospects if competition is still cherished by the MoD.

VT – along with other shipyards in Europe -– wonder what is happening with the Horizon (hull) programme of the Common New Generation Frigate, but the company can carry on with new build programmes, including MV Triton, the trimaran warship demonstrator.

The first steel for this innovative ship was cut at VT's Woolston yard in the south of England on 11 January.

Newport News and Avondale Industries merge

Newport News Shipbuilding (NNS) and Avondale Industries (AI) have merged in a deal worth US$470 million, *writes Josh Corless*. The combined company, with 1999 revenues projected at US$2.6 billion, will be known as Newport News Avondale Industries (NNAI).

William P Fricks, Chairman and Chief Executive Officer of NNS, said: "Newport News Avondale Industries will be the only shipbuilder in the US with operations on the East, West and Gulf coasts. Our geographic diversity enhances the combined company's ability to deliver high-quality, cost-effective fleet maintenance services to the US Navy, and arguably makes us the most capable shipbuilder in the nation." AI's experience in the design and construction of navy and commercial surface ships complements Newport News' strengths in aircraft carrier and submarine construction, refuelling and overhaul. "Together," said Albert L. Bossier, Jr., Chairman and CEO of Avondale, "we can design, build, and maintain every ship in the Navy and Coast Guard fleets." All existing Newport News and Avondale sites will remain operational, employing an estimated 24,000 people.

The funded contract backlog of NNAI is nearly US$6 billion. Backlog, inclusive of options and planned funding, totals nearly US$8 billion. Fricks points out that "the company's backlog represents a broad spectrum of shipbuilding programmes, the majority of which is comprised of long term US Navy programmes."

Newport News' backlog includes over US$2.5 billion for aircraft carrier construction, refuelling and life-cycle maintenance extending through 2002. Newport News is contracted for US$1.7 billion to deliver the USS *Ronald Reagan* (CVN-76) by 2002 and CVN-77 in 2008. The contract to design and deliver the first four of the USN's new attack submarine constitutes approximately US$1 billion in funded backlog, with an additional US$1 billion expected within the next three years. Newport News also holds a US$1 billion contract to refuel and overhaul the USS *Nimitz* (CVN-68).

Avondale's backlog of US$2 billion includes the continued design and construction of two LPD amphibious assault ships – the first of a 12-ship class to be built for the USN. Avondale is also building a series of roll-on/roll-off transport ships for the US Military Sealift Command, three crude oil carriers for ARCO Marine and is scheduled to deliver the Polar Icebreaker *WAGB Healy* to the USCG in mid-1999.

News in brief

● FMF-contract for SEAHAKE
US-based Lockheed Martin Tactical Systems Company, (LMTSC) has signed a US$65 million Foreign Military Financing (FMF) contract with STN ALTAS Elektronik GmbH for series production of German SEAHAKE heavyweight torpedoes. LMTSC will serve as prime contractor and manufacturer of the torpedoes while STN ATLAS Elektronik GmbH retains design authority for the technology. Under a separate but parallel contract, STN ATLAS will also undertake the integration of the US manufactured SEAHAKE into its ISUS command and weapon control system.

● New comms for Turkey
The Turkish Navy is to equip four of it *Dogan*-class PCFG (Fast Attack Craft-Missile) boats with new VLF, HF and V/UHF integrated communications systems provided by Marconi Kominikasyon AS (MKAS) – the Turkish subsidiary of Marconi Communications. The contract, worth an estimated US$8 million, was placed by the Turkish Ministry of Defence and will be carried out in stages by MKAS, with support from Elmer, another Marconi Communications subsidiary.

● Viking Group formed
Industrial representatives from Denmark, Norway and Sweden have formed an industrial consortium aimed at collaborating on the Viking submarine project. The companies – Danyard Aalborg AS (Denmark), Kongsberg Defence and Aerospace AS (Norway) and Celsius (Sweden) – have agreed to co-ordinate the development of a next-generation submarine for their respective navies. By creating the group, defence ministers in all three countries hope to contain military spending through joint defence procurement.

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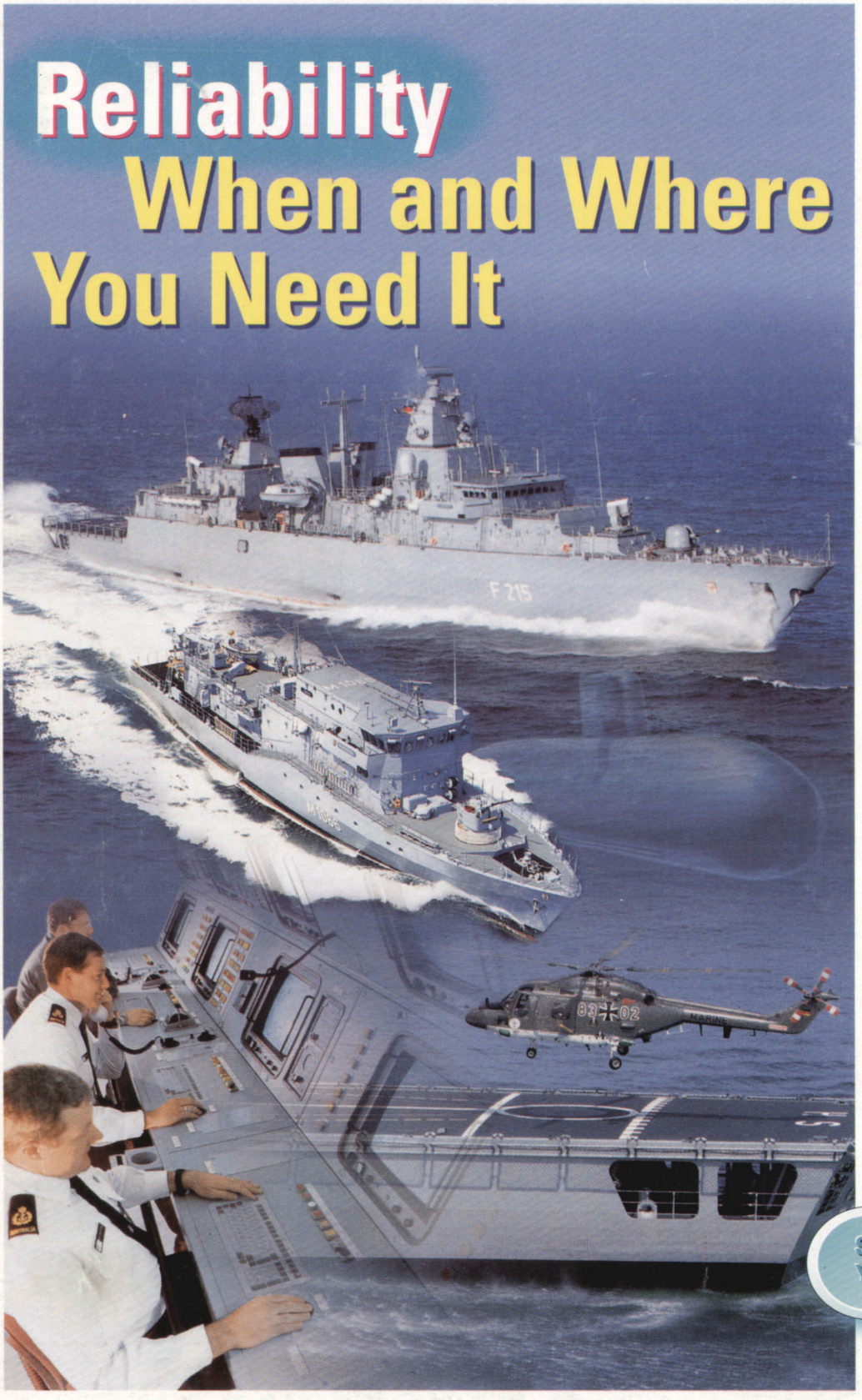

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